THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIII. No. 1357.] LONDON, MAY 14, 1889. [41ST YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.

Warranted Free from Adulteration. **TORBAY PAINTS.**

FOR GASHOLDERS, &c., &c.

The Original "Torbay Paints"

As supplied during many years to the LONDON GASLIGHT & COKE COMPANY.

TORBAY & DART PAINT Co., Ld.,
23, Gt. George St., Westminster, S.W.
DARTMOUTH, & BRIXHAM (TORBAY).

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.

Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES
Manufacturing Gas Engineers.
See Advertisement, p. 829.

CEMENT
EARLE'S
BEST
PORTLAND CEMENT
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.

PROMPT DESPATCH:
Seven Jetties on the River.
Two Private Railway Sidings.

FACILITIES FOR DESPATCH:
Six Railway-Waggon Entrances with Steam and Hydraulic Cranes.
Four Rully Entrances.
Three different Railway Companies within easy carriage distance.
Storage Capacity 8000 tons.

Office: 7, PIER STREET.
Works: WILMINGTON.

ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.

"Abyssinian" Tube Wells.
Pure Water Supplies
LE GRAND & SUTCLIFF,
100, BUNHILL ROW,
LONDON.

R. Dempster & Sons, Ltd.

GAS, CHEMICAL, & HYDRAULIC ENGINEERS & CONTRACTORS, ELLAND, YORKS,

Makers of **Reciprocating Pump Exhausters**, and of the **Elland Rotary Exhauster**, which cannot be surpassed for efficiency or superiority of workmanship.

Of the Two Sets fixed at Migan, each of which passes 80,000 cubic feet of Gas per hour, Alderman James Smith says: "Your Exhausters have given us the most complete satisfaction, and are well made and highly finished." Mr. Timmins, Engineer, says: "The results I have attained with your Exhausters are most satisfactory. I have a perfect gauge; they work noiselessly; and the workmanship and material are excellent throughout."

GASHOLDERS of any size, SCRUBBERS, CONDENSERS, PURIFIERS, RETORT-FITTINGS, and every description of GAS and CHEMICAL PLANT.

Makers of LIVESEY'S PATENT WASHERS (for the Colonies and Abroad).

ESTIMATES, PRICES, AND FULL PARTICULARS ON APPLICATION.

NOTE THE ADDRESS— **ELLAND, YORKS.**

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS,

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.,

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

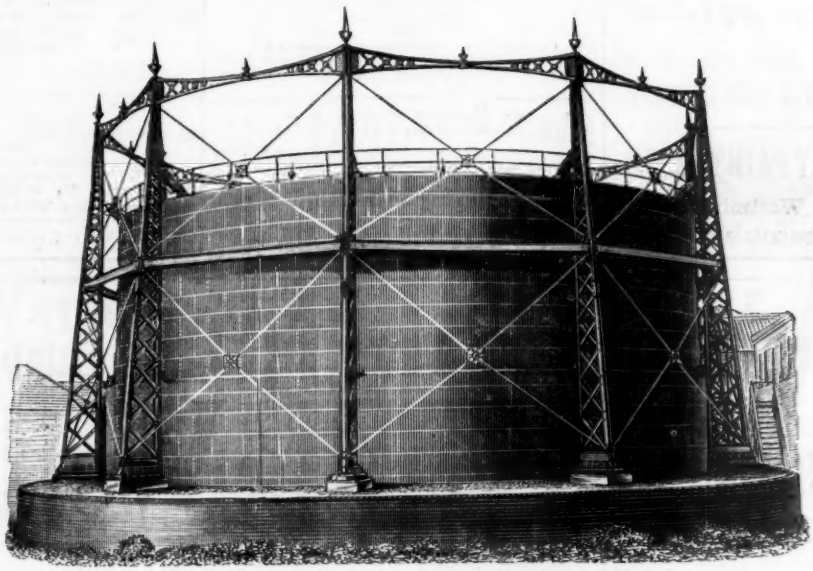
TELEGRAPHIC ADDRESS: "COCKEYS FROME."

EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

Gas Engineers, Ironfounders, & Contractors,

Manufacturers of *GASHOLDERS and TANKS, BOILERS and ENGINES, ROOFS, EXHAUSTERS, BREEZE SCREENS, CHARGING and COKE BARROWS.*



Manufacturers of *PATENT WASHERS, PATENT VALVES for PURIFIERS, &c., GOVERNORS, LAMP COLUMNS, Weighbridges, COKE BREAKERS.*

SOLE MAKERS OF COCKEY AND SMITH'S PATENT SELF-ACTING BYE-PASS VALVES.

Estimates for any description of Gas Plant on application.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street. BIRMINGHAM: 114, Colmore Row. LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO.,

(ESTABLISHED 1822)

SPRING HILL, BIRMINGHAM,

MANUFACTURERS OF

GAS APPARATUS

OF EVERY DESCRIPTION

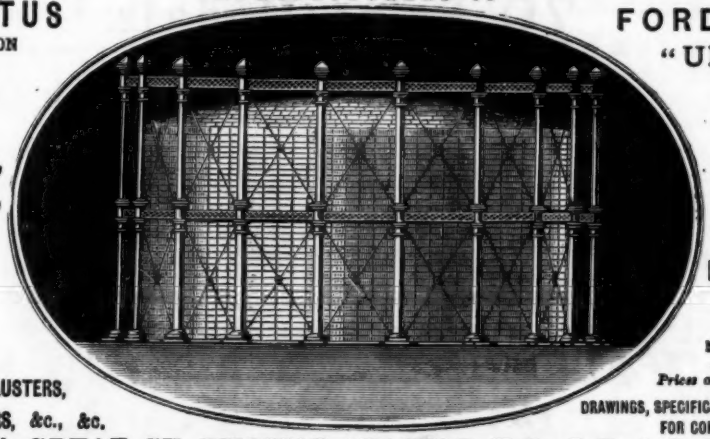
INCLUDING

GASHOLDERS and Tanks, Retorts, Purifiers, Valves, Scrubbers, Condensers,

ETC., ETC.

All of the most approved Designs.

BOILERS, ENGINES, PUMPS, BEALE'S and other EXHAUSTERS, METERS, GAUGES, GOVERNORS, &c., &c.



FORD'S PATENT "UNIVERSAL" SCRUBBER-WASHER.

Numbers at work, giving excellent results.

No Motive Power Required.

ALSO OF

SOMERVILLE'S PATENT

RETORT MOUTHPIECES AND SELF-SEALING LIDS.

NO LUTING REQUIRED.

Prices and Particulars on application.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES PREPARED FOR COMPLETE GAS PLANT.

London Offices: 14, GREAT ST. THOMAS APOSTLE, E.C.—J. E. & S. SPENCER, Agents.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION, OR Internal or External SCREWS, of all Sizes.

GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS,

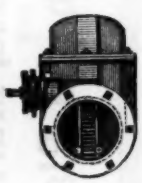
RETORT-BED FITTINGS, AND RETORT-HOUSE APPLIANCES of every description.

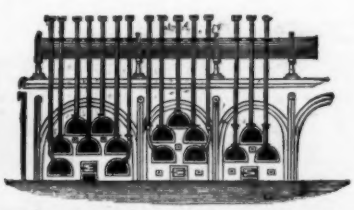
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

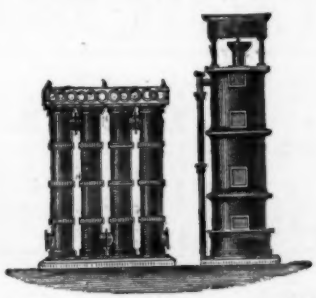
WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS

TAR AND LIQUOR PUMPS, &c.

PATENT CENTRE VALVES for working Purifiers. Also Bye-Pass & Stop Valves.





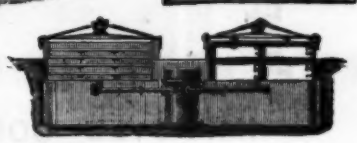


PURIFIERS with Planed Joints.

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

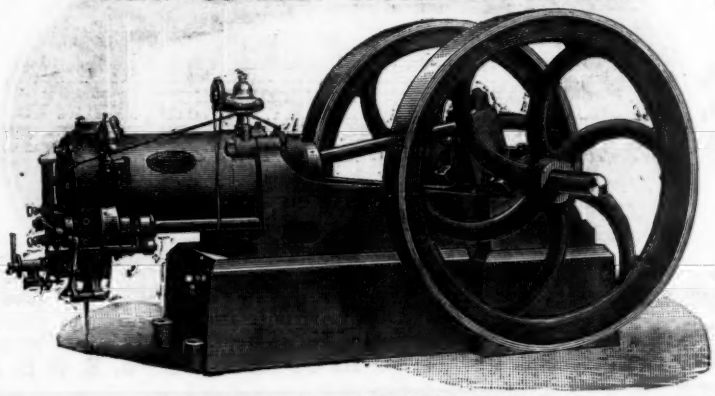
Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

70 Prize Medals.

NEW 14 H.P. NOMINAL SIZE.



MADE in SIZES
2 Man to 100 HP.

GAS-ENGINES
COMBINED
WITH
PUMPS
FOR
TOWNS SUPPLY,
SEWAGE &c., &c.

GAS-ENGINES
COMBINED
WITH
AIR COMPRESSORS
FOR THE
SCHONE SEWAGE
SYSTEM, LUCIGEN
LIGHT, &c.

MADE in SIZES
2 Man to 100 HP.

VERTICAL
AND
HORIZONTAL
TYPES.

ENGINES
COMBINED
WITH
HOISTS, PUMPS,
DYNAMOS, &c., &c.

Largely used for
EXHAUSTING,
PUMPING,
COKE CRUSHING,
ELECTRIC LIGHTING
&c., &c.

Over 27,000 "OTTO" ENGINES have now been made.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER, LONDON, LIVERPOOL, GLASGOW, NEWCASTLE.

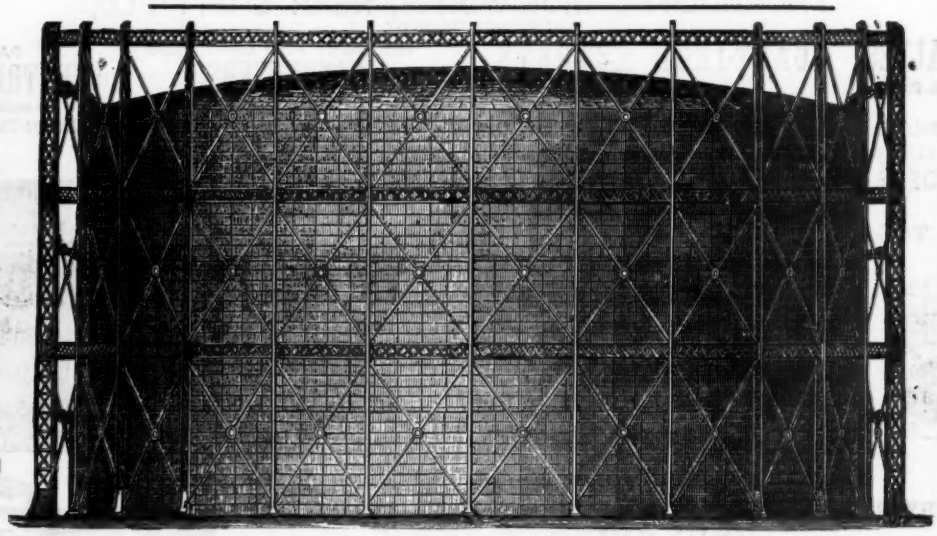
HARRIS & PEARSON,
STOURBRIDGE, ENGLAND.
MANUFACTURERS OF
FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description
GLAZED BRICKS AND PORCELAIN BATHS.

W. C. HOLMES & CO.,

ENGINEERS & CONTRACTORS FOR GAS-WORKS,

WHITESTONE IRON-WORKS, HUDDERSFIELD,
And 80, CANNON STREET, LONDON, E.C.

GASHOLDERS of Improved Construction.



Tar, Sulphate, Muriate, and Liquid Ammonia Plants.

MAKERS OF
IMPROVED CONDENSERS, SCRUBBERS, AND WASHERS;
PURIFIERS with PLANED JOINTS; CENTRE-VALVES TO WORK ALL FOUR PURIFIERS; EXHAUSTERS,
AND ALL APPARATUS and FITTINGS used in GAS MANUFACTURE.

KIRKHAM, HULETT, & CHANDLER, Ld.,

PALACE CHAMBERS,

9, BRIDGE ST., WESTMINSTER.

Mr. S. HERSEY, Managing-Director.

IMPORTANT NOTICE!

THE "NEW" PATENT

"Standard" Washer-Scrubber

(Thoroughly extracts every grain of Ammonia and a large quantity of other Impurities from Gas)

Has been for many months in successful and satisfactory operation at

The Gaslight and Coke Company's Station at

BECKTON,

Resulting in a second order just received to fit up a Washer-Scrubber, of 2½ millions capacity, upon this new principle, at the same station. Other orders for these machines are in course of execution.

A very large amount of patronage has been accorded the "Standard" Washer-Scrubber, of which, up till now, **367** have been supplied, representing a daily make of **318,260,000** cubic feet of gas; but the advantages of the "**New Standard**" will be readily recognised, and its superiority over the present "Standard" may be briefly summarized as follows:—

1. The weight in motion is **only one-seventh** of that in the present machine.
2. It requires only **one-seventh** the power to drive; consequently effecting a large reduction in cost of Engine as well as in steam power.
3. **The Wear and Tear is enormously reduced,** as the Shaft has comparatively little weight to carry.
4. It has been found that the washing surfaces **keep perfectly clean** and free from deposit from end to end of the Machine.
5. It is so constructed that it forms a most powerful, effective, and complete system of purification, gives no pressure, and can be removed and replaced without trouble or injury.
6. The "New Standard," owing to the foregoing, can be supplied at **a large reduction in price.**

Engineers desirous of working Ammoniacal Liquor over and over again prior to leaving the "New Standard" can do so by the automatic and simple arrangement which forms part of this patent.

The Apparatus can be applied to "Standard" Washer-Scrubbers already in use.

Particulars will be furnished upon application to the above address.

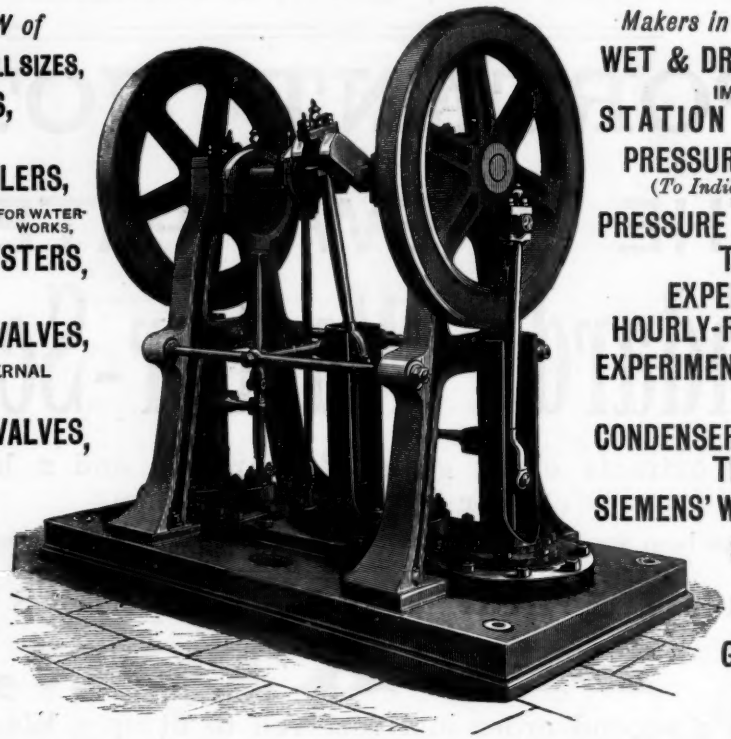
R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

Manufacturers of **GAS APPARATUS** of every Description.

Makers in GLASGOW of

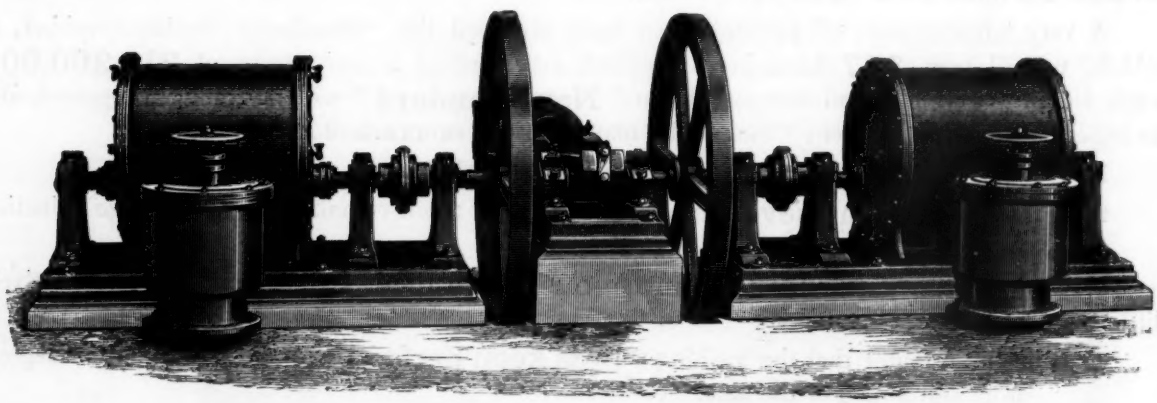
CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES,
INTERNAL AND EXTERNAL RACK OR SCREW SLIDE VALVES,
CAST-IRON COLUMNS,
BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES, FITTINGS, &c.



Makers in EDINBURGH of

WET & DRY GAS-METERS,
IMPROVED STATION GOVERNORS,
PRESSURE REGISTERS (*To Indicate New Time*),
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS,
EXPERIMENTAL TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS,
And all Kinds of GAS APPARATUS AND FITTINGS, &c.

PUMPING GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,
INTERNATIONAL EXHIBITION, EDINBURGH, 1886.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

TANGYES LIMITED,

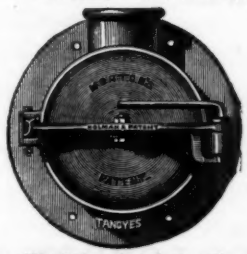
CORNWALL WORKS, BIRMINGHAM.

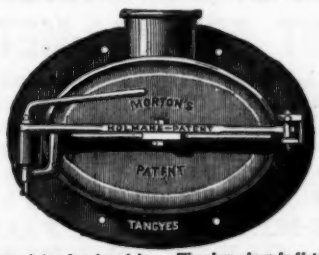
DEPÔTS AT

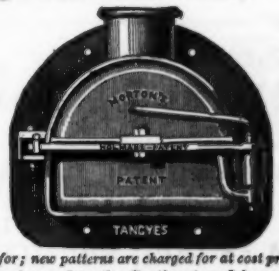
LONDON . . . . . 35, QUEEN VICTORIA ST., E.C. | MANCHESTER . . . . . DEANSGATE
NEWCASTLE-ON-TYNE ST. NICHOLAS BUILDINGS | GLASGOW . . . . . ARGYLE STREET

Sole Makers of **MORTON'S** Patent Self-Sealing **RETORT-LIDS,**

With Anti-Friction CATCHES, and Self-Sustaining CROSS-BARS.







Price of Mouthpieces depends on number required, which please state when inquiring. The sizes given in list we have patterns for; new patterns are charged for at cost price.

These Patent Retort Lids and Fastenings are in extensive use in most of the Gas-Works in Great Britain, America, and on the Continent, and have almost entirely displaced the older method of sealing by a luting of lime or other material. The Lids are made in three forms, D, oval, and round (as shown above), in each of which we have a very extensive variety of patterns, from which Gas Engineers contemplating the adoption of these lids are recommended to make their selection, in order to avoid cost of pattern making, delays, &c., &c.

Mouthpieces with Circular Lids for Oval Retorts.

Pattern No.	Diam. Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
13658	14 ins.	14 × 12 ins.	15 ins.	£0 19 0
4356	14 „	18½ „ 12 „	12½ „	0 19 0
6851	15 „	16 „ 14 „	18 „	1 0 0
3629	15 „	18¼ „ 13½ „	14 „	1 0 0
3580	15 „	21 „ 15 „	15 „	1 0 0
6264	16 „	18½ „ 15½ „	15¼ „	1 1 0
5210	16 „	20 „ 14 „	15 „	1 1 0
6263	16 „	24 „ 16 „	13½ „	1 1 0
5370	17 „	20 „ 14 „	14 „	1 3 0
6832	17 „	20 „ 14 „	17 „	1 3 0
6183	17 „	20 „ 15 „	15 „	1 3 0
4289	17 „	21 „ 15 „	14 „	1 3 0
5270	17 „	23 „ 14 „	14 „	1 3 0
3631	18 „	18 „ 14 „	20 „	1 5 0
3681	18 „	21 „ 14 „	13½ or 15 „	1 5 0
3554	18 „	21 „ 15 „	14½ „	1 5 0
7957	18 „	23 „ 16 „	14 „	1 5 0
8048*	19 „	25½ „ 15 „	18 „	1 8 6

Mouthpieces with Oval Lids for Oval Retorts.

Pattern No.	Dimensions of Mouth.	Internal Dimensions of Retort.	Length of Mouthpieces.	PRICE, Lid and Fittings without Mouthpieces.
9800	18 × 14⅞ ins.	18 × 14⅞ ins.	15 ins.	£1 5 0
9205	20 „ 12 „	24 „ 14 „	10½ „	1 10 0
10000	20½ „ 14½ „	20½ „ 14½ „	15 „	1 10 0
9680	21 „ 15 „	21 „ 15 „	15 „	1 12 0
10056	21 „ 14½ „	21 „ 14½ „	15½ „	1 12 0
13218	21 „ 15 „	21 „ 15 „	17 „	1 12 0
10514	22½ „ 18⅜ „	22½ „ 18⅜ „	18½ „	1 13 0
13766	20 „ 17 „	20 „ 17 „	15½ „	1 15 0
13269	24 „ 15 „	24 „ 15 „	16 „	1 18 0

190

Mouthpieces for Round Retorts.

Diam. .. .. ins.	14	15	16	17	18
Price, Lid and Fittings without Mouthpiece £	0 19 0	1 0 0	1 1 0	1 3 0	1 5 0

Mouthpieces with Circular Lids for D Retorts.

Pattern No.	Diam. Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
5348	14 ins.	14 × 13 ins.	7 ins.	£0 19 0
3463	15 „	15 „ 13 „	14 „	1 0 0
6678	15 „	15 „ 14 „	12 „	1 0 0
3661	15½ „	15½ „ 13 „	12 „	1 1 0
13052	16 „	16 „ 13 „	18 „	1 1 0
5601	16 „	16 „ 14 „	15 „	1 1 0
6827	16 „	16 „ 14 „	17 „	1 1 0
4494	16 „	16 „ 14 „	14 „	1 1 0
3548	16 „	16 „ 15 „	12½ „	1 1 0
6677	16 „	16½ „ 13½ „	12½ „	1 1 0
9645	16 „	16½ „ 13½ „	12½ „	1 1 0
4434	16 „	17½ „ 14 „	14 „	1 1 0
6469	16 „	18 „ 14 „	15 „	1 1 0
9015	16 „	18 „ 14 „	18½ „	1 1 0
4327	16 „	18 „ 15 „	15½ „	1 1 0
8049*	16 „	18 „ 15 „	17½ „	1 1 0
6137	16 „	20½ „ 13½ „	18½ „	1 1 0
5918	17 „	18 „ 14 „	14 or 17 „	1 3 0
5053	17 „	19½ „ 12 „	14½ „	1 3 0
7548	17 „	20 „ 13 „	15 „	1 3 0
6468	17 „	20 „ 16 „	15½ „	1 3 0
4316B	17 „	21 „ 14 „	14 „	1 3 0
7975	17 „	21 „ 15 „	14½ „	1 3 0
13459	17 „	21½ „ 13½ „	15 „	1 3 0
12990	18 „	18 „ 15 „	15 or 19 „	1 5 0
7135	18 „	18½ „ 15 „	13 „	1 5 0
10221	18 „	18 „ 16 „	19½ „	1 5 0
4506	18 „	20 „ 13 „	19½ „	1 5 0
6479	18 „	20 „ 18 „	15 „	1 5 0
6818	18 „	20 „ 13½ „	17½ „	1 5 0
4083	18 „	20 „ 15 „	16 „	1 5 0
5306	18 „	20½ „ 14 „	18½ „	1 5 0
13295	18 „	20½ „ 14 „	19½ „	1 5 0
7356	18 „	20½ „ 13½ „	13 „	1 5 0
4569	18 „	21 „ 14 „	18 „	1 5 0
3628	18 „	21 „ 15 „	16 „	1 5 0
7640	18 „	22 „ 12½ „	13½ „	1 5 0
7971*	20 „	20 „ 15 „	18 „	1 11 0

*Patterns marked * have Sockets at back to connect to Retorts; all the others are flanged. Patterns marked B have curved bottoms.* 191

Mouthpieces with D Lids for D Retorts.

Pattern No.	Dimensions of Mouth.	Internal Dimension of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpieces.
12292	15½ × 13 ins.	15½ × 13 ins.	12 ins.	£1 2 0
9967	16 „ 14 „	16 „ 14 „	12½ „	1 3 0
13574	16½ „ 13½ „	16½ „ 13½ „	12½ „	1 4 0
9899	18 „ 12 „	18 „ 12 „	14 „	1 4 0
12980	16 „ 16 „	16 „ 16 „	18 „	1 6 0
13900	18 „ 13½ „	18 „ 18 „	15 „	1 6 0
9912	18 „ 13½ „	18 „ 18½ „	17 „	1 6 0
9962	18 „ 13½ „	18 „ 13½ „	16 „	1 6 0
10982	18 „ 13½ „	18 „ 14 „	15 „	1 6 0
11098	18 „ 14 „	18 „ 14 „	12 „	1 6 0
9492	20 „ 13 „	20 „ 13 „	15 „	1 10 0
9208	20 „ 13 „	20 „ 13 „	19½ „	1 10 0
10251	20 „ 18 „	20 „ 18 „	15½ „	1 10 0
12964	20 „ 18 „	20 „ 18 „	13½ „	1 10 0
9909	20 „ 13½ „	20 „ 13½ „	17 „	1 10 0
12969	19½ „ 15½ „	19½ „ 15½ „	14 „	1 11 0
13781	20 „ 15 „ Front. / 21 „ 15 „ Back.	21 „ 15 „	15 „	1 11 0
7692	21 „ 15½ „	21 „ 15½ „	16 „	1 11 0
12978	20 „ 16 „	20 „ 16 „	17 „	1 11 0
13252	20 „ 16 „	20 „ 16 „	18 „	1 11 0
13220	21 „ 15 „	21 „ 15 „	17 „	1 11 0
8977	21½ „ 13½ „	21½ „ 13½ „	18½ „	1 11 0
8976	21½ „ 13½ „	21½ „ 13½ „	18½ „	1 12 0
10497	21½ „ 13½ „	21 „ 13½ „	18½ „	1 12 0
8037	21½ „ 18½ „	21½ „ 18½ „	18½ „	1 12 0
9908	21½ „ 18½ „	21½ „ 13½ „	15 „	1 12 0
10404	21½ „ 18½ „	22 „ 14 „	18½ „	1 12 0
12410	21½ „ 18½ „	22 „ 14 „	13 „	1 12 0
13822	21½ „ 13½ „	22 „ 14 „	15 „	1 12 0
10515	22½ „ 12½ „	22½ „ 12½ „	13½ „	1 12 0
7924	24 „ 14 „	24 „ 14 „	15½ „	1 13 0
13807	24 „ 15½ „	24 „ 15½ „	16 „	1 14 0
9015B	25 „ 14 „	25 „ 14 „	13½ „	1 14 0
10932	25 „ 14 „	24 „ 14 „	13½ „	1 15 0
12944B	22 „ 16 „	22 „ 16 „	16 „	1 15 0

Patterns marked B have curved bottoms. 192

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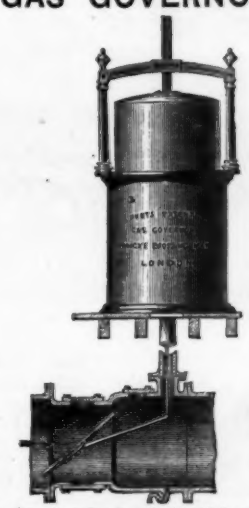
GAS GOVERNOR.



In this Governor a throttle valve is substituted for the ordinary suspended cone; all external communication being avoided by placing the lever or radius arm inside the valve chamber upon the disc.

The disc is carried upon steel centres, upon which it is accurately balanced.

4 ins. .. £17 0	8 ins. .. £25 0	14 ins. .. £42 0	20 ins. .. £60 0
5 „ .. 20 0	10 „ .. 33 0	16 „ .. 46 0	24 „ .. 72 0
6 „ .. 22 10	12 „ .. 38 0	18 „ .. 50 0	36 „ .. 130 0

195

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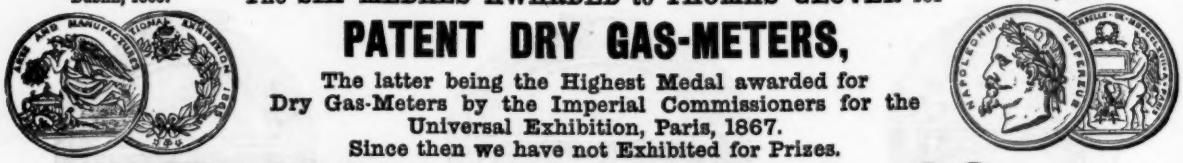
London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.



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Since then we have not Exhibited for Prizes.

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DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

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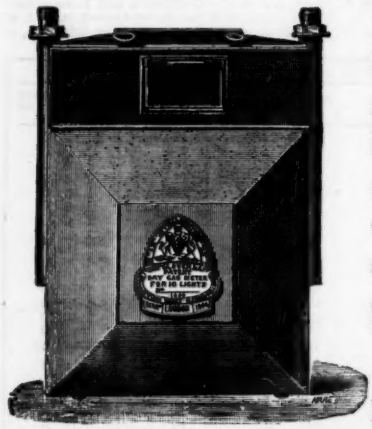

1st—Are a remedy for all the defects of Wet Meters
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by frost, however severe.
5th—Are the most accurate & unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.
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Meters fitted with Grey's Index or Harding's Counter.

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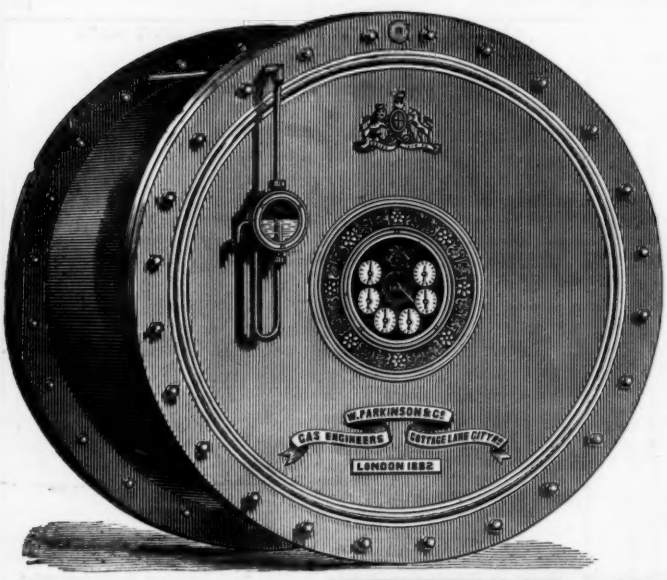

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever if intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 14, 1889.

GAS STOKERS AND THE EIGHT-HOURS MOVEMENT.

THE relations between capital and labour constitute a problem that is constantly being presented to us in a fresh phase. For some years this so-called "labour question" has not troubled the British manufacturer, because the notorious slackness of trade has involved both employers and employed in a struggle for mere existence. The employer has in many instances kept his doors open in order to save his sunk capital; and the employee has recognized this condition, and put up with his own share in the badness of the times. Now, however, through some mysterious change in those conditions of its existence which are more easily felt than distinguished by name, trade is looking up. There has been a general advance of values, if not all along the line, still in many departments of commerce and industry. It was experienced in the gas industry as soon as in any other. Stocks of coke mysteriously melted; there was a better demand for gas; and tar burning became less and less an economical practice. Increases in the price of gas, which had been resorted to in various places, gave way to the more favoured movement in the direction of greater cheapness. With these altered signs of the times came, of course, other changes. Coals began to "harden" in value; and freights went up. Tar distillers roused from their long depression, and once more assumed the airs of prosperity, not to say fatness. With all this came less satisfactory proofs of the altered state of things. The coal miners wanted more money—a perfectly natural demand, which was wisely granted without demur in some parts of the kingdom. In a large section of the coal-producing regions of England, however, the request of the men was refused by the employers with every protestation of inability to concede it. A formidable strike actually began; but a few days of suspension of work sufficed to terminate the resistance of the coal-owners, who gave in one after another to the terms asked for by the men. Commenting upon this strike and its termination, we remarked at the time upon the folly of the employers, who only hung together sufficiently to issue loud-sounding proclamations of their intention to resist the men to the uttermost, and then fell away ignominiously, belying the solemn protestations of their supporters of the technical and general Press, that the condition of trade did not justify the payment of the wages asked. We have never, in these columns, committed ourselves to a side in these labour troubles, but have endeavoured to treat every case of the kind on its merits. In the case of the coal-miners as well as in that of coal-carriers, we have always maintained that the interest of gas supply does not require coal and freights to be so low as to involve bankruptcy for the owners of coal mines and ships, and starvation wages for their workers. Payment for supplies at rates that permit everybody concerned to live, must be better in the long run than any system of prices cut down to the famine point in the supposed interest of one party to the bargain. Gas supply, in particular, being a statutory matter, in regard to which the undertakers are protected by law from loss, we have always held that similar consideration should be extended by them to merchants and manufacturers with whom they have dealings. It has never appeared to us a pleasant sight to see a gas company or corporation committee exacting the "pound of flesh" from an unfortunate contractor whom the turn of the market, or other uncontrollable cause, had left at their mercy. Able to vary the selling price of their staple commodity within limits generously calculated to preserve their invested capital from depreciation in value, they, at least, as we have held, should abstain from driving hard bargains or seeking advantage from the loss of an unprotected trader. Similarly with the *employés* of gas companies. We might easily fill a column with references to places where the JOURNAL has argued, pleaded, and protested in multifarious ways in favour of liberal justice being accorded, in respect of pay, to all grades of gas-works officials and workmen. We are clear from all imputation of partiality in this matter, and have on all occasions preached the doctrine of "Live and let live" without reserve or distinction as between provider and consumer, employer and employed.

This reflection inspires us with confidence for dealing with a matter that threatens to divide gas managers and stokers in the near future—at first, perhaps, only in London, but afterwards, in every probability, in all parts of the country. To speak of a prospective gas stokers' strike might be an exaggeration of the existing state of the question; but it is at least certain that a movement, which may be summed up as an organized demand for more pay and less work, is on foot among the London gas stokers and firemen. Meetings have already been held in the orthodox way, and another was called for last Sunday, at which the horny-handed sons of toil were cordially invited to be present in their "thousands" and make their demands heard. It is understood that the movement is under the direction of the Amalgamated Society of Gasworkers and General Labourers of Great Britain and Ireland, of the character and status of which organization something may be gathered from the report of Sunday's proceedings in another column. It is rumoured that the gas stokers have been favoured with the assistance of orators not all so horny-handed as themselves; although there are undoubtedly some among

them—old stagers of the last grand strike—who do not require outside instruction in the arts of the trade agitator. We do not object to gas stokers trying to better themselves in a reasonable way, and admit that there is not much to find fault with in the conduct of the present agitation, such as it is, up to the present stage. The leaders are very cautious in the advice they offer to those who listen to them; contenting themselves with counselling union, abstention from public-houses, and patience until another winter gives the men the opportunity for compelling acquiescence with their demands. All this is rational enough. If workmen have a grievance, it is only natural that they should meet together to discuss it, and combine to obtain relief—choosing their own time also for making their attack in an effectual manner. So long as they keep their heads, and remain within the bounds of law and order, gas stokers have as much right as any other order of workmen to amuse themselves with mass meetings, processions, and stump orations.

The question that will be put by those to whom the report of a gas stokers' agitation is news will naturally be, What do the men want? To this query it may be replied that, in the first place, the movement appears to be mainly in advocacy of an eight-hours day, with a reduction of the number of mouthpieces worked per shift. Of course, the idea is that the same rate of pay should be continued, if not increased; so that, as already stated, the agitation amounts to a demand for less work and more money. At any rate, the employers would have, if this demand were granted, to pay a great deal more money for the work done. Now, we have no hesitation in declaring that the success of this movement would not be beneficial to the men. From all that can be learned at present, the demand for an eight-hour shift will be strongly resisted by those who, by reducing Sunday work, granting holidays, and in other ways, have testified to their interest in the welfare of gas-works labourers throughout the kingdom. These will contend that the supposed boon would do more harm than good to the men themselves; while the attempt to manage the new order of shifts would be an unmitigated nuisance in the works. In the first place, the six-hour system of charging, which, on the whole, is necessary for the bulk of the coal carbonized in London works, does not lend itself fairly to three shifts per twenty-four hours. Such a system would not work so well as the existing one in connection with the Sunday stoppage; and it is very doubtful whether the shifts would come on as regularly as they do now, because many of the men would have several hours of idleness per day, at times when they could hardly employ leisure to advantage. The system of three shifts has, we believe, been tried and abandoned in several English towns; and we are not aware of one where it is actually in vogue. Of course, this is no argument against the plan, if it can be shown to be desirable; but it at least throws the onus of proof of advantage on those who advocate it. If it is sought for simply on the general ground of what is known as the "eight-hour move-"ment"—which presumes that diminution of the hours of labour to this limit must be a good thing *per se*, then we totally deny the proposition. If it could be shown that the labour (say) of gas stokers is so exhausting that men cannot stand it for longer than eight, or even six hours at a stretch, as with some other kinds of labour that need not be detailed here, the question would occupy a different position. Nothing of this kind is attempted, however, so far as can be learnt. The labour of gas stokers is intermittent; and a shift of twelve hours of it has never been found to injure any healthy man. The plea for eight hours is to be regarded, therefore, as merely a development of the politics of labour, with which humanitarianism and political economy have nothing to do. All such movements are to be looked upon as, in a sense, bubbles on the surface of the workings of the modern industrial system from the feudal order towards the socialistic ideal, revealing the turmoil going on underneath. According as observers are inspired with what are commonly recognized as old-fashioned notions of the respective places to be occupied by employers and employed, or with other ideas regarding the future of capital and labour, so these social phenomena will be esteemed as threatenings of anarchy or promises of regeneration. While refraining from discussing the subject on this footing, we may nevertheless remark that nothing in the doctrine of sociology which permits and encourages a man to make the best terms for his labour, refutes the proposition that the more fully a man is employed, with due regard to his bodily health and individual claims as a member of the community, the better it is for him. In the case of a workman or labourer whose occupation is purely physical, it is better for him to be at work to the full extent of his capacity than to be compelled to pass in pernicious idleness hours which in the vast majority of instances he cannot employ with advantage to himself or to the community. If all workmen had their eight hours of work and their hours of leisure simultaneously, the benefit would be questionable; but when, as in the case of the gas stokers of at least one of the three daily shifts, their idle time would fall during hours when all other respectable men are at work, and none but loafers are available for them to imitate and associate with, the objection is greatly strengthened.

A CRITICISM OF GAS LIGHTING.

To "see ourselves as others see us" is a privilege sometimes honestly desired; but when the opportunity offers, we are apt to argue over the terms of the description, instead of trying to profit by it. An address delivered at Hastings by Major-General Webber, C.B., R.E., in his capacity of President of one of the Sections of a Health Congress, an abstract of which appears elsewhere, may be profitably read as an indication of what a scientific engineer and electrician thinks about gas and other systems of artificial lighting. The address must have been very interesting, if we may judge of the whole from the portion devoted to the subject of lighting, which was treated in a very fresh and genial style. Major-General Webber would probably agree with us in wishing to see the whole question of the sociological aspects of artificial illumination in the modern style discussed by some competent authority. We hold that the influence of the introduction of a cheap and efficient illuminant, such as gas has proved itself to be, upon the development of modern communities, is one of the points most worthy of the attention of a philosophic observer desirous of finding the key to the century's progress. Major-General Webber talks of the increased value of labour and general raising of wages due to good artificial lighting; but these are only a part of the whole. The contrast between a nation compelled, for want of good artificial lighting, to cease at dusk from all activity, mental and bodily, that cannot be carried on within the range of the rays of a tallow candle, and a community enjoying gaslight, if fully worked out would be an epitome of all that distinguishes modern from mediæval civilization. The rich do not experience such a great difference in their assemblies, for they use the same wax candles as, although more of them than their ancestors patronized. The student in his lonely room may employ the same kind or amount of oil that served his great predecessors; but outside these modern counterparts of antique luxury and study lies the world in which the change has been wrought. What does modern progress in civility owe to good and abundant artificial lighting? Say, rather, where would it have been without this prime necessary of modern town life? Major-General Webber has one or two interesting things to say about the early days of gas lighting; and if he is a trifle shaky in some of his references and comparisons, it must be remembered that he does not speak as an authority on the history of gas lighting, but only as an intelligent observer of the general subject. We do not know, for example, what he means by comparing English regulations bearing upon the quality and purity of gas with French, to the disadvantage of the former. We had thought that there is nothing in France or anywhere else to compare, in respect of completeness and severity, with the system carried out under the supervision of the Metropolitan Gas Referees. Certainly, the gas supplied in Paris is neither so rich nor so elaborately purified as that sold in London. We do not say this with any desire to disparage Continental gas, the quality of which is largely a question of the description of local coal carbonized, but merely to justify us in demurring to Major-General Webber's presentment of the matter. With regard to his anticipations of the eventual triumph of electricity over gas, we venture, after a review of the facts at least as impartial as his own, to dissent altogether from his conclusion. He speaks as an electrician, of course; and while disposed to believe that nothing would gratify electricians more than the general adoption by Gas Companies of electric lighting as a branch of their business, we hold that there is nothing to induce the most grasping, or, to put it differently, most energetic gas company to make any such departure. Prophecies and beliefs inspired by a fond and not always logical regard for what is called science are one thing; worldly wisdom is another. Scientific men are not necessarily wise, any more than wise men are in all cases scientific. A person who can lecture upon the conservation of energy does not

always know better on which side his bread is buttered than another whose philosophy is that of the market-place. The adage that "the proof of the pudding is in the eating" was true before it was ever suspected that there was any essential difference between scientific and unscientific ways of losing or earning money. Therefore, we are not ashamed to say that for the present there appears to be more moonshine than profit in electric lighting, The experience of the Imperial Continental Gas Association in Vienna and of gas and electric companies in America has not been such as to make British Gas Companies complain of being restrained by law from going outside their own legitimate business. They have not learnt anything, even from recent proceedings before Major Marindin, with regard to the proposals for supplying electric light to London, to cause them to regret their lot; and they are quite resigned to see their so-called more scientific rivals working out the rainbow-hued destiny which Major-General Webber declares to belong to them.

THE WELSBACH BURNER—A STRANGE TALE.

It is impossible to pass over without comment the remarkable condition into which the affairs of the Incandescent Gas-Light Company, Limited, have drifted. A report of the proceedings at the recent annual general meeting of the Company, at which a Committee of Investigation was appointed with the full concurrence of the Directors, will be found elsewhere. The Welsbach incandescent gas-burner has received a very great deal of attention, both from the makers of gas and their customers; and at one time there was talk of its being a possible substitute for the open-flame burners whereby the illuminating power of coal gas has been traditionally developed. There was, however, always something mysterious, not to say unreliable, in the proceedings of the controllers of the Welsbach patents; and we never thought very highly of the burners for general use. It now appears that the prospects of the Company are blighted by an extraordinary incident, recalling the wonderful story of Dr. Jekyll and Mr. Hyde, as told by that most entertaining of modern romancers, Mr. E. L. Stevenson. It will be remembered by those who have read the story in question that when he had exhausted his original stock of the drug which possessed the power of transmuting his two personalities into one another, Dr. Jekyll could not renew the supply, and so perished miserably. So it appears that, after they had begun to get together a promising business—selling 700 lamps a day—the Welsbach Company suddenly experienced a most disastrous check by reason of a change for the worse in the character of the fluid in which the "mantles" are dipped to imbue them with the necessary refractory quality. The durability of the mantles consequently fell to the vanishing point, and so did the prospects of the Company; for thousands of the lamps they had sold were returned, and their business was brought almost to a standstill. The loss to the Company is only partially indicated by the adverse balance of £13,604 in the profit and loss account. It is claimed that the difficulty has now been surmounted, and that a good stock of fluid of the proper quality for dipping the mantles has been secured; but, of course, this is not very much comfort for the shareholders. It will be for the Committee of Investigation to find out how this extraordinary condition of affairs has come to pass, and what blame, if any, attaches to the management. At present the whole story reads like a fairy tale or romance; and it remains to be explained how the fortunes of a great undertaking were wrecked by something which would appear, as at present reported, to have been within the power of a qualified testing officer to deal with before much damage had been done.

Water and Sanitary Affairs.

It is a matter of no very great importance whether the particular case of *Humphreys v. The Southwark and Vauxhall Water Company*, reported in last week's Journal, should be disposed of, in its first stage, in the County Court or in the High Court of Justice. If the decision, which we will not take upon ourselves to anticipate, should prove to be unsatisfactory, we doubt not that some means will be found of questioning it by way of appeal. The amount claimed is not large; but the principle involved in this action, and in actions of a similar character, undoubtedly is of considerable moment to all Water Companies. The plaintiff's claim is based on the fact that, by reason of a fire-plug giving way in one of the Company's mains, a quantity of water escaped, and caused damage to his property. This, it was argued before Baron Pollock and Mr. Justice Manisty, constituted *primâ facie* evidence of negligence. This presumption may for the moment be allowed; but, of course, it is open to rebuttal. The water-main in question was laid beneath a public roadway at Peckham Rye, in pursuance of the statutory powers conferred on the Company. The fire-plug originally occupied its proper position in the main; but, as it is supposed, by the use of a steam-roller or through repairs to the road, that position was subsequently altered, with the consequence that the plug was forced out, and the water from the main blown on to the plaintiff's goods, which were exposed for sale on the adjacent footway. In such circumstances, can the Water Company be held liable for the damage done to the goods? The point is one upon which it is quite likely that Judges might differ, as they have already differed in regard to cases involving somewhat similar considerations. First and foremost, can it be said that an escape of water in itself furnishes *primâ facie* evidence of negligence? The case of *Fletcher* v. *Rylands*, cited by Counsel for the defendant Company in Mr. Humphreys's action, cannot be regarded as a direct authority on this point, as it only arose incidentally when some years ago that case was disposed of by the Judges of the Queen's Bench Division. Moreover, on that occasion there were indications of a difference of opinion between the members of the Court, which consisted of Justices Blackburn, Mellor, and Lush. All that was distinctly laid down by the Court was that where the owner of land, without wilfulness or negligence, uses it for ordinary purposes, he will not be liable for damages, even though in some way injury should be occasioned to his neighbour's property. But if he brings upon his land anything which would not naturally come upon it, or which is in itself dangerous, he will be liable in damages for any mischief which may be occasioned to another's property. These abstract propositions will be better appreciated in relation to the actual facts of the case. The defendant had constructed a reservoir, employing competent persons for the purpose; but, nevertheless, through want of care in blocking up certain old and disused shafts, water escaped, and flooded the plaintiff's mine. The Court held that, in respect of this injury, damages were payable by the defendant. It will be seen, however, that the older case, which involved a dispute between individuals, was by no means on all fours with the pending action against the Southwark and Vauxhall Company, who appear to have acted without negligence, and in pursuance of an express statutory authority. The Water-Works Clauses Act, 1847, requires a Company to keep charged with water all pipes to which fire-plugs are fixed; and it would be strange indeed if, in the absence of direct and positive proof of negligence, such a Company could be held liable for consequences which arise primarily from compliance with the law, but which have been accelerated by the acts of those over whom the Company cannot possibly exercise control.

Presentation to Mr. S. Holden.—The members of the Nelson Local Board recently presented an illuminated address to Mr. Samuel Holden, who for eleven years has filled the position of Water Manager to the Board. Mr. Holden is the oldest servant under the Board; he having been connected with the authority since its formation some 25 years ago. During this time he has filled various public appointments—first as Collector, then as Engineer, afterwards as Surveyor and Sanitary Inspector, and lastly as Water Manager. In each capacity Mr. Holden has enjoyed the full confidence of every member of the Board.

The Question of Lighthouse Illumination.—In the Journal for the 9th ult. it was stated that arrangements had been made for a new inquiry into the subject of lighthouse illuminants by a Committee of the Royal Society, consisting of the President (Professor Stokes) and two Fellows of the Society to be selected. We now learn that the President has nominated as his colleagues Sir William Grove and Lord Rayleigh. The functions of the Committee are confined to deciding whether "the conclusions of the Trinity House, as set forth in their reports on lighthouse illuminants, are justified by the records of the experiments contained therein."

Death of Mr. H. Davidson.—We regret to learn that Mr. Henry Davidson, who for about the last 25 years represented throughout Scotland and Ireland the well-known firm of Messrs. James Milne and Son, of Edinburgh, died on the 5th inst., in his 70th year. Mr. Davidson had been "on the road" for nearly 50 years, and looked forward to a well-earned retirement on attaining his jubilee. His death has called forth expressions of regret from an exceptionally wide circle of friends connected with the gas industry, who appreciated his robust personality and strongly-marked character. He was eminently a traveller of the olden time; accomplishing his rounds with persistent regularity, and given to expressing himself in rather *brusque* terms in regard to the "fly-about" tendencies of the "new order."

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 919.)

Although money has continued easy, and nothing has occurred to cause apprehension in financial circles, yet the general tendency of the stock markets during the past week was dull. Some markets, owing to a lull in speculation, have been wholly inactive; and in the rest the prevailing disposition was to realize the profits secured by recent advances in price. Still there has been no considerable fall; and it is just as likely as not that a fresh upward movement will set in very soon. The Gas Department has been no exception to the general dulness; all variations in quotation being in the downward direction, except in the case of one or two Foreign undertakings. The Metropolitan Companies have all suffered more or less. Gaslight "A" has receded 3 more; and the quotation now stands about 10 lower than it was three weeks ago. The lowest price was reached on Wednesday, when the stock was done at 253. From that point it began to show signs of rallying; and the last mark on Saturday was 255. The secured issues of the same Company were also weaker, and were offered with more freedom than usual. In the result, the 10 per cents. are from 1 to 2 lower; and the 7 per cent. maximum has receded 2. In South Metropolitans, the "A" is steady; but "B" is quoted 2 lower—the last transaction being at 243. It must, however, be borne in mind that, price for price, the "B" is still quoted considerably higher than the "A." Having regard to prospective values, as gauged by the next authorized dividend, that position ought to be reversed. In Commercials, nothing has been officially marked, and the quotation of the old stock has been put down 2; but we have heard of it being quietly bought outside the market for investment, where obtainable. Among the Suburban and Provincial undertakings, a couple of transactions in Brentford new are about all there is to note. The Foreign division shows the only advances in quotation effected during the week. Australian debentures have improved 1; and Bombay is ¼ better. On the other hand, Imperial Continental has been unsteady, and was done as low as 214 on Wednesday; but the later transactions were firmer. Still the quotation is 1 lower. The Water Companies have shown more activity. Prices remain for the most part unchanged; but Lambeth 10 per cents. are 1 lower, while Southwark "D" is 1 higher.

The daily operations were: The Gas market opened rather heavy on Monday, and business was limited. Gaslight issues were flat. "A" and "J" fell 1 each; and "C," "D," and "E," and "H," 2 each. Australian improved 1. In Water, a little business was done in Kent and New River at moderate figures; and the changes noted above were effected. Gas was a shade steadier and quieter on Tuesday. Nothing moved but Bombay, which rose ¼. Water debentures were particularly active. Gas was more active on Wednesday, but the tone was flat. Gaslight "A" fell 2 more; and Imperial Continental wavered. In Water, Lambeth and New River marked middle prices. The tone in Gas on Thursday was no better. Imperial Continental receded 1. Water was moderately active at good average figures. On Friday the downward course of Gaslight "A" seemed fairly arrested. Business was largely in that stock and the Company's other issues. The other two Metropolitan Gas Companies were dull; and Commercial old fell 2. Water transactions were all in secured issues. Saturday was extremely quiet. There was hardly any business in Gas. South Metropolitan "B" stock fell 2. Water was quite stagnant.

ELECTRIC LIGHTING MEMORANDA.

MR. W. H. PREECE ON SECONDARY BATTERIES—ELECTRIC LOCOMOTION *v.* LIGHTING—A MISLEADING REPORT—THE ELECTRIC LIGHT VENTURE OF THE IMPERIAL CONTINENTAL GAS ASSOCIATION.

It is apparently not in the nature of Mr. W. H. Preece to remain quiet for very long together. He is continually to the fore with a paper on some electrical question; and favours in turn all the scientific societies which are open to him for this purpose. His last performance in this line was a paper on secondary batteries, read before the Society of Arts. There does not seem to be any particular reason why Mr. Preece should have read this paper, for he had nothing very new or instructive to say on the subject, except perhaps that the question had not been formally before the Society since 1883, and it was considered advisable that secondary battery lighting should receive a fresh advertisement. Mr. Preece ran through the different types of secondary batteries in ordinary use in this country, describing their construction and management, and naming the purposes for which they are regarded as suitable. It does not appear, however, that the ubiquitous Post Office electrician was able to add anything to the common stock of knowledge on this subject; and one of his expert hearers, Mr. Crompton, told him so in almost as many words in the course of the subsequent discussion. A little more of this kind of thing, and Mr. Preece will not find societies so willing to take his papers. People are, in short, becoming somewhat tired of his garrulity, and would sooner listen to the words of some of those electricians who have done more than Mr. Preece, even if they have not talked quite so much. With regard to the question of the use of accumulators in electric lighting, there is not much more to be said than has been repeatedly urged for and against them. They provide a useful reserve of power in the not-uncommon event of a breakdown of electric light machinery, and their construction has been considerably improved of late years. All the same, they seriously enhance the cost of electric lighting, and do not appear to be susceptible of any cheapening process.

Although the suitability of electricity as a medium for the application of motor power is loudly vaunted, there is great delay in the practical application of electro motors. Recently the Elieson Electric Company, after trying vainly to work tramcars by electricity, came to utter grief, and their property and patents were offered for sale by auction. As there were no buyers, even at the "knockdown" prices that would have been accepted by the liquidator, this particular system of electrical traction is still very much "in the future." The contrast between promise and practice in the case of the Elieson Company is very significant. If there is one use for which electrical traction would be hailed as a boon by the public, it is this of tramway working; the present horse-power service being slow and painful. There are electrically worked tramways and railroads in various places; but these all have a small, make-shift air about them which does not impress an on-looker with the idea that electrical traction is a sterling success. Without saying anything about the application of electricity to haulage on common roads, it is probably quite safe to state that the rewards in store for those who shall bring out a really acceptable system of electrical tram and light railway working far surpass what may be gained in the department of artificial lighting.

An example of the manner in which it is sometimes sought to prove that electric lighting is gaining ground and gas lighting is going backward, is furnished by the French electrical journal *L'Electricien* (which as quoted by the *Electrical Review*) declares that the increase in the number of electric light stations in Paris is already affecting the consumption of gas. It is stated that the official figures relating to gas consumption in the French capital show an output in February last of 25,342,868 cubic metres, whereas in February 1888 the figure was 26,189,563 cubic metres, being a decrease of 846,695 cubic metres. Seeing that the report and accounts of the Paris Gas Company, of which we recently gave a translation, show an increase for the year of 6,923,280 cubic metres of gas sold, and of 11,980 in the number of consumers on the books, this statement of the electricians appears to require to be taken with more than the customary allowance of "salt." It is quite possible, however, that the figures relating to the gas consumption for February may be correct, although the interpretation which they are made to bear is manifestly wrong. It is nothing unusual, in the experience of gas engineers, to find fluctuations in the demand for gas for short periods of successive years; these being generally attributable to climatic variations. To pounce upon an isolated example of this sort, and attach to it a wide significance, is merely to court exposure and ridicule, as in the present instance.

An attempt was made at the recent meeting of the Imperial Continental Gas Association to obtain some more definite information respecting the electric lighting experiment connected with the Vienna Station of the Association than has been hitherto vouchsafed by the Board. It was not conspicuously successful. Not the slightest mention of the matter was made by the Chairman, Sir Julian Goldsmid, nor would anybody gather from the very general statement which constitutes the Directors' report, the faintest indication of what the Association are doing in this respect. A proprietor, Mr. Greville Palmer, rose to ask the Chairman some questions indicating a desire to urge the Board further on the way which they entered upon for special reasons at Vienna; and this gave Mr. George Livesey the opportunity for stating the opinions he is known to entertain on the unwisdom of meddling by gas companies in electric lighting affairs. Mr. Livesey charged it upon the Board that they had spent £300,000 of the money of the Association upon their Vienna electric lighting experiment; and the impeachment was not denied. In his reply, Sir Julian Goldsmid practically admitted that the Board had had enough of electric lighting; for he declared that, although asked again and again to do elsewhere what they had done in Vienna, they had "not considered it wise or prudent to do so." He would only say that, in his judgment, the Vienna experiment was justified for special reasons, and that the loss on the venture has been small. With these admissions, the proprietors of the Association will have to be content. They may at least rest assured that they will not be saddled with any more electric lighting speculations. The whole thing has not been at all encouraging to the partizans of electric lighting, for although after much trouble the Gas Company have managed to show as perfect a display of electric lights as there is anywhere in Europe, the cost has been enormous, and the Company are determined not to have any more to do with it than they are obliged by their engagements. If there had been anything in electric lighting, even for Vienna, which is one of the most favourable places is Europe for its development, the Association would have been quite able to have profited by it. There was nothing to prevent them from absolutely changing their base, and making electricity their main business instead of gas, if it had been worth their while. What is the fact, however? That they have already seen the extent of the electric light interest, so far as they are concerned, and instead of finding their new department injuring the old, the sale of gas has so much increased in Vienna that they are actually erecting the largest gasholder on the Continent—a triple lift of 205 feet in diameter—to provide for the enlarged demand. The question may therefore be asked, "What is the light of the future" for Vienna?

ROBERT PAULSON SPICE.

The profession of gas engineering has lost one of its veterans. Robert Paulson Spice—hero of many a hard parliamentary fight, champion of many a desperate cause, and warm-hearted friend of two generations of young gas managers—passed away peacefully and painlessly on Saturday morning last, at the ripe age of 75. His was a unique place in the ranks of professional men, which can never be filled by another. He belonged to an order of gas engineers who have almost died out. His connection with the management of gas undertakings began with the construction of the works for lighting his native town of Fakenham, in Norfolk, where he was at the time carrying on the business of an ironmonger. Leaving this place, he settled in Richmond, Surrey, where he devoted himself to the management of gas-works under leases, according to a very general practice of the time. He opened offices on Cornhill in 1860, about which date and for several years following he was lessee of the gas-works at Wandsworth, Hampton Court, Richmond, and Watford. He also built gas-works at Great Yarmouth, Boston (Lincolnshire), Tunbridge Wells, Tattershall, Abingdon, Hartley Wintney, Hoddesdon, and other places. Thus, like most other gas engineeers of his epoch, he grew into his place by experience, and held it by a native aptitude for the business of his choice. He was largely consulted by gas companies and local authorities for arbitrations, rating appeals, &c.; and he had an extensive parliamentary practice. He possessed the gifts necessary for an expert—ready wit, keen appreciation of the bearings of a situation, and facility of expression. Unfortunately for himself as well as for others, Mr. Spice was prone to adopt with excessive warmth projects in which he was professionally engaged, whether they turned out well or ill. He was at one time identified with a water-gas scheme, which he described before the British Association of Gas Managers in 1876, and worked experimentally at Wormwood Scrubs. This scheme was taken up by the New Gas Company, under whom it was tried on a working scale, and failed, at the works of the Crystal Palace District Gas Company. Some years later Mr. Spice became a partizan of the St. John and Rockwell condensing and carburetting apparatus, which he brought under the notice of The Gas Institute in 1881; and his last *protégé* was the Cooper coal-liming process, the circumstances connected with his advocacy of which are too recent to need re-statement. He was a regular supporter of the British Association of Gas Managers; often speaking at the meetings. He was elected a member in 1868, and was President for 1876-7, from which period dates the Benevolent Fund, whereof he was one of the first supporters, and moved the resolution upon which the fund was established. Besides being a Past-President of The Gas Institute, Mr. Spice was a Member of the Institution of Civil Engineers, a Member of the Institution of Mechanical Engineers, a Past-President of the Society of Engineers, a Fellow of the Royal Geographical Society, and a very distinguished Freemason. His engineering work has covered a period of half a century; for there is an inscription still in existence, taken from the old Hoddesdon works, bearing the words "R. P. Spice, Engineer, 1847;" and this, as already stated, was not his first piece of construction. That he retained his activity to the end is shown by the fact that his last new gas-works, at Riddings, are only just completed, and we believe still await the final certificate. He was sitting in the Ross arbitration on Wednesday last, showing no signs of failing health. Next day, however, he caught a chill, and was attacked by bronchitis, which confined him to his bed. None thought the end was so near, and he himself believed the worst was past; but failure of the heart's action brought him peace quite suddenly. He leaves a son—Professor Spice, of Brooklyn—and a daughter. The funeral service will be held at St. Margaret's, Westminster, where the deceased was a seatholder, at 12.30 to-morrow (Wednesday).

All who knew Robert Paulson Spice will join with us in lamenting his loss; for a kinder heart never beat. Benevolent to a fault, many went to him in distress and received relief. He was only too open with his hand, and too ready with his support for all who appealed to him for help. He has become known to a wider circle than even his personal friends and acquaintances through the simple chatty little books in which he was accustomed to write the records of his journeyings as the "Hermit of Westminster," and which reveal his kindly nature. Strong partizan as he was, it may be doubted if he has left an enemy in the world. Certainly, there is none that ever knew him, whether as friend or opponent, but will bear with sorrow that the wanderings and work of the Hermit are over.

The letters of allotment and regret for the issue of £250,000 of 4 per cent. perpetual debenture stock of the Gas, Water, and General Investment Trust, Limited, have been posted.

At the meeting of the Bury Town Council last Thursday week, a recommendation of the Gas Committee to advance the salary of Mr. W. Woodward, the Gas Engineer, by the sum of £100 per annum was adopted.

At the meeting of the Institution of Civil Engineers last Tuesday, Mr. Alfred Colson, Engineer and Manager of the Leicester Corporation Gas-Works, was transferred from the class of associates to that of members.

By an advertisement which appears elsewhere, our readers will see that the old-established gas-meter business carried on by the late Mr. Denis Murphy, under the style of Messrs. Fletcher and Murphy, at Manchester, is about to be disposed of.

GAS PURIFICATION BY OXYGEN AT RAMSGATE.

The members of the Southern District Association of Gas Managers with a number of friends, visited Ramsgate last Thursday. The party was received by Mr. W. A. Valon, Engineer of the Corporation Gas-Works, and conducted by him to the Granville Hotel, where luncheon was partaken of, and a few words of welcome spoken by Alderman Pygott, Chairman of the Gas Committee. After luncheon, Mr. Valon read a short paper on the application of oxygen in the purification of gas, which matter he has had in hand—first at Westgate, and now at Ramsgate—for some considerable time. It was the principal business of the day to inspect this process in operation; Mr. Valon having kindly arranged to show it to his visitors, although, as a matter of choice, he would probably have preferred this inspection to have been a week or two later, for reasons to be mentioned farther on. The paper was not meant to be exhaustive, but only to revive in gas engineers the interest in the subject which was aroused by the same author's communication to The Gas Institute last year, and to prepare them for what they were to see on the works. The text of the paper will be found elsewhere. There was no discussion at this stage of the proceedings, as, indeed, there could not be in the circumstances; and the only criticism the subject received was in the form of the innumerable questions with which Mr. Valon was plied while exhibiting his working.

The subject of the use of oxygen in gas purification is so familiar to our readers that it would be superfluous to offer any statement of the elements of the question. Suffice it to say that it grew naturally out of the successful admixture of atmospheric air with unpurified gas before its admission into the purifiers, as in the ordinary way of purification by either lime or oxide, or both. The oxygen of the air revivified the oxide, so to speak, and enabled it to continue taking up the sulphur of the gas until fully charged therewith. Also with lime it effected the reduction or fixation of the sulphur, with arrest of the majority of the sulphur compounds. Of course, this process was attended by the unwelcome addition to the gas of the light-destroying component of nitrogen, which when once admitted could not be got rid of. It was argued, however, that the nitrogen of the proportion of air required for the process—about 2½ per cent.—did not lower to any appreciable extent the illuminating power of the gas containing it. Seeing that the operation of the process depended wholly upon the oxygen of the air, the advisability of using oxygen alone, if it could be obtained for the purpose at a sufficiently low cost, would occur to anybody who should practise this method of gas purification as the next step in its development. Oxygen was not commercially available, however, until the Brin process was imported into this country; when Mr. Valon experimented with the gas at Westgate, and obtained the results he has already published, and which he regarded as sufficiently encouraging to warrant him in going into the matter on a large scale at Ramsgate.

Before this could be done, it was necessary to review the Brin oxygen-making process. The oxygen with which Mr. Valon experimented at Westgate was conveyed to the gas-works compressed in cylinders; and what it cost, only the makers could tell. It was made by exposing barium at a dull red heat to air, when oxygen was absorbed; and after a time the heat was raised by from 200° to 300° Fahr., when the absorbed oxygen was given up into the storeage provided for it. It is evident that this process must always have been slow; and the necessity for alternately raising and lowering the temperature of the barium containers was a great drawback to the efficiency of the method. With all this, however, the process was a very elegant one, and a vast improvement upon anything that had ever been done before in the way of oxygen making. Yet it still fell very far short of what Mr. Valon, looking at the matter from the standpoint of the practical gas manager, saw it must be if it were ever to be admitted into a gas-works. He perceived that the necessary oxygen must not only be made on the gas-works, but must also be produced much more rapidly, and, in short, in a more work-a-day style, than that exhibited in the plant as imported, which was scarcely fit to be handled by any but trained chemists. It is greatly to Mr. Valon's credit that he has succeeded in revolutionizing the Brin process after the fashion displayed on Thursday; making it a true appendage to coal gas plant, requiring no more attention than any other apparatus in the retort-house and engine-room.

The retorts containing the barium are steel tubes, 5 inches in diameter, 16 of which are set, for the sake of protection, in four round retorts occupying an arch in the retort-house. They are maintained at a dull red heat by one of Mr. Valon's generator furnaces, just similar in all respects to an ordinary setting of retorts. These barium tubes are connected with an air-pump, which forces into them air, previously dried by being passed through a quick-lime box, under a pressure of 15 lbs. per square inch. After five minutes' pumping, the machine is reversed, and the tubes are placed under an exhaust of 26 inches for the same period of time, when the oxygen previously taken up from the air under pressure is given out into the small gasholder, or compensator, provided for the purpose. From this, it is admitted into the foul-gas main at the rate of 0·5 per cent. of the gas made. Mr. Valon's improvement of the Brin process deserves to be considered by itself, altogether apart from the distinct question whether or not oxygen is entitled to be esteemed a valuable aid in the purification of coal gas. This latter may or may not be true, according to circumstances; but it is not to be denied that the commercial production of oxygen has been vastly improved by Mr. Valon, who has substituted regular for the varying heats at

first deemed essential for the working of the Brin process, and has altered the slow into a quick reaction. At present the five-minute changes of the force-pump are made by hand; but the substitution of automatic action for this constant attention is very obvious, and would have been effected by Mr. Valon if the visit of inspection had only been a week later. When this is done, the cost of making oxygen on a gas-works will be reduced to a very small matter, for the engine and exhauster man will be able to look after the pumps, and the only running expense will be the cost of steam, oil, and fuel for the retorts, which is hardly worth mentioning. Mr. Valon's present battery of barium retorts will make 2000 cubic feet of oxygen, of 90 per cent. purity, per day. At least double this, and probably three times as much, could be produced in the space of an ordinary retort-setting with not one-half the consumption of fuel required for coal carbonization.

With regard to the utilization of the oxygen when made, we must refer to Mr. Valon's paper and our report of the proceedings in the retort-house, when both Mr. Valon and Dr. Thorne (the Consulting Chemist of the Brin Company) were subjected to a close and severe cross-examination by some of the members. It was the first series of purifiers that had been worked by Mr. Valon at Ramsgate with oxygen; and he had not even seen them opened since the experiment began. Gas was passing through three 16-feet boxes in series; the first having been turned into clean, on the 24th of April. This box, containing at first 12 yards of lime, was on Thursday the foul box; and it was opened for inspection, although it would still have done a considerable amount of work if it had been allowed to run its full time. (We hear that the box was put to work again after having been thus opened, and is still active.) In consequence of this anticipation of events, the contents of the box were not fully carbonated. It should be remarked that the lime looked exactly like ordinary foul, non-carbonated gas lime, except that it did not give off such fumes. Mr. Valon claims that the effect of the addition of oxygen is that the contents of a lime-box take up carbonic acid and sulphur simultaneously, and that the sulphur becomes fixed at once, instead of first forming with lime the unstable sulphide, and then being driven over by the progressive carbonation of the lime, as in the ordinary process of lime purification without air. He says that in this way the lime, when taken out of a thoroughly spent box, will contain 20 per cent. of free sulphur, which could be recovered if it were worth while; and the rest would be inert carbonate. This is also what is claimed by the practitioners of the air process introduced by Mr. M'Minn, and of its varieties and modifications. But Mr. Valon contends that the absence of the nitrogen in his case renders the action of the purifiers much more active—enabling the same work to be done with boxes of half the size required with the air process, to say nothing about the question of gain in illuminating power. This, of course, is just the point that remains to be settled by prolonged experiment. What Mr. Valon has done, and done well, is to make practically pure oxygen as easy to obtain as common coal gas; and he has also shown a very good case for its use in gas purification. He maintains that his experience with oxygen at Ramsgate, short as it is, has proved to him that he need not trouble himself for a long time to come with regard to purifier extension, whereas but for this assistance he was decidedly becoming pinched in this respect. The supreme advantages of oxygen over air for purification, however, may be safely left to be demonstrated by time. They do not depend upon, and will not be affected permanently by, the predilections and prejudices of individuals. It is sufficient credit to Mr. Valon that he has placed another purifying process at the command of his brethren. Whether they use it or not is their own affair.

Statistics of Gas Supply in Scotland.—The report of the Committee of the North British Association of Gas Managers giving statistics of the gas supply in Scotland for the past year has just been issued, under the supervision of the Secretary, Mr. R. S. Carlow, Engineer and Manager of the Arbroath Corporation Gas-Works. Particulars are furnished from two additional towns—Bushby and Keith; but there are still many blanks which require filling up before these statistics can be made as valuable as they would be if the Committee's efforts to ensure their completeness were more cordially supported.

Gas Enterprise in South Africa.—In another part of the Journal will be found the prospectus of the Johannesburg Gas Company, Limited, which has been formed, with a capital of £200,000, in £1 shares, to supply Johannesburg, in South Africa, with gas. The Company have acquired a concession which gives them an exclusive right for a period of 50 years, to lay down pipes and sell gas in the above-named town and its suburbs; the Government claiming one-fourth of the profits realized after a clear sum equivalent to 10 per cent. upon the issued capital has been retained by the Company. It will be remembered that towards the close of last year Mr. T. Newbigging, C.E., the Company's Consulting Engineer, visited South Africa for the purpose of testing the native coal and selecting a site suitable for gas-works; and, as will be seen, his report was of the most favourable character. To the business of gas supply the Company contemplate adding that of coal selling, for which they have obtained Government sanction. The undertaking therefore promises well. Only 130,000 out of the 200,000 shares have been issued, and these have all been taken up privately; the remainder being held in reserve for possible future requirements.

Notes.

The Permeability of Cement and Brickwork.

At a recent meeting of the Engineers' Club, of Philadelphia, Professor L. M. Haupt presented some notes upon the permeability of cements and mortars, and cited a variety of experiments conducted with a view to elucidate the subject. Mr. James B. Francis has ascertained that about 17¼ gallons of water per square foot of surface will pass through a thickness of 16 inches of cement in 24 hours under a pressure of 77 lbs. per square inch. Mr. Stauffer constructed a bulkhead of brick, laid in cement, 4 feet thick, and found that under a pressure of 72 lbs. per square foot the water percolated through it at the rate of 1200 gallons per square foot per day. The experience of the Boston main drainage works proved that it was not practicable to build brick masonry that was watertight under a pressure of 64 lbs. per square inch. At the new Croton reservoir, New York, water under 36-feet head has been found to percolate through 26 inches of brickwork and 4 feet of concrete. Bricks are very permeable by water. A good specimen of a well-burned brick passed 23·4 cubic inches of water in an hour under a pressure of 80 lbs. per square inch. Blocks prepared with one part of cement to two of sand, passed under the same pressure very much more water than the brick. The fineness of a cement is one of the most important considerations in regard to its resistance to permeation by water, which is also affected by the method of handling of the cement mortar or rendering.

Special White Paints.

An article on some special white paints has been contributed to the *Builder* by Mr. H. C. Standage. After describing the good qualities and defects of common white lead—the former consisting chiefly in its body, or covering power, and the latter in its poisonousness and liability to discoloration by sulphurous fumes, the writer went on to describe the nature of other commercial white paints, including Griffith's patent zinc white, Freeman's non-poisonous white lead, and zinc oxide. With regard to the first of these substitutes for white lead, Mr. Standage described it as economical in many ways, exceeding white lead in covering power, practically non-poisonous, and not liable to lose colour by contact with sulphur. The same was said of Freeman's preparation, which resists the action of weather better than white lead, and blends with other colours better than zinc oxide. Zinc oxide is the whitest of all white paints, but it is deficient in body and a bad dryer in oil, especially on a non-porous surface. Mr. Standage tried all these paints on a slip of black polished ebonite, which would not absorb the oil, and from its colour would give a good indication of the covering power of the pigments. No driers were used; the paints being thinned with linseed oil only. The experiment gave the following results, the calculation being worked out from equal weights of each pigment. Freeman's white lead covered 36 square inches; ordinary white lead, 57; zinc oxide, 90; Griffith's zinc white, 98. Thus it appeared that Griffith's zinc white covered more than double the surface covered by Freeman's white lead, and exhibited a greater opacity; but Freeman's white lead dried with a harder surface, more like an enamel. Zinc oxide was the whitest in tone of all the four paints; while white lead was not superior to any of them, but was in many respects positively inferior.

Steel Making by Natural Gas.

It is reported in the *American Manufacturer*, that Letters Patent have been issued lately by the United States for a new process in the manufacture of steel. Briefly, the process consists in forcing natural gas through the molten steel in the Bessemer converter after a blow, or into the bath of the open hearth immediately before drawing off the metal. It is claimed that in this way steel may be carbonated very effectually, enabling manganese to be dispensed with. It is stated that the gas coming into contact with the molten metal dissociates into carbon and hydrogen, part of the carbon going into the bath to carbonate the iron, part uniting with the oxide left in the bath by the air, while the hydrogen largely assists in deoxidation. It may be said that if natural gas can be used in this way, other varieties of hydrocarbon gases might be similarly employed; but it is contended that artificial hydrocarbon gases are not adaptable for the purpose, notwithstanding the fact that they are made of the same elements as natural gas. Their point of dissociation is very low on the thermometric scale, as is the case with all hydrocarbon gases and vapours that can be easily condensed. Natural gas, on the contrary, requires on the one hand very great cold and very high pressure to bring it to a liquid form, and on the other hand it can only be dissociated at a high temperature. It is stated that natural gas can only be dissociated at about 1500° Cent., while it requires a pressure of about 50 atmospheres with intense cold to liquefy it. Now, when any ordinary hydrocarbon gas or vapour, which will dissociate at a temperature below 1000° Cent., is injected into a bath of molten iron, it is immediately dissociated with such explosive violence as to scatter the fluid metal in all directions. Not only so, but such great quantities of carbon are disengaged that they cannot be absorbed by the metal, and therefore cannot bring about the desired carbonation. Natural gas dissociates at about the temperature of the molten bath of metal, and if not fed in too quickly, the dissociation is slow enough for the deoxidation and carbonation of the iron. Experiments conducted on a large scale are stated to have shown that steel produced in this way by the action of natural gas is of a very superior quality.

Communicated Articles.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XVIII.

In the annexed table is gathered together a summary of the principal properties of the various constituents that enter into the composition of illuminating gas. With the exception of hydrogen and carbonic oxide (also nitrogen, oxygen, water, and carbonic acid, which are in no sense necessary constituents), they all consist of compounds of hydrogen and carbon. The first column shows the titles; the proper chemical name according to the present state of theory being printed in small capitals, while the other names are either popular commercial terms, or else those found in older books of chemistry. The proper chemical symbol is given for each constituent in the second column, and the small figure placed at the foot of each letter gives a great deal of information as to the composition. It not only affords the particulars which are given in columns 3, 4, 5, and 6, but enables those in columns 13, 14, 15, and 16 to be computed.

The various hydrocarbons are divided into five series or groups, each possessing a family likeness in respect to composition. Thus $C_n H_{n+2}$ represents the constitution of any member of the methane series; $C_n H_{2n}$, that of any of the ethylene series; $C_n H_{2n-6}$, the benzene series; and so on. It should be clearly understood that the names included in this table represent only the lighter members of each series; showing them in the order of their specific gravity. Both the methane and the ethylene series comprise several more members, traces of which are not unlikely to be present in illuminating gas, though on account of their high density and boiling point, the bulk of them is usually removed in the condensers. The methane series, for example, comprises that important class of compounds known as paraffins. Other classes of hydrocarbon compounds are also known, but are not found to constitute any important part, at any rate, of illuminating gas. Columns 3 and 4 show the number of volumes of hydrogen and carbon vapour respectively that enter into the composition of one volume of each constituent; and Nos. 5 and 6 show the constitution as found by analysis. The ethylene series affords a convenient illustration for explaining a difficulty that perhaps arises in the mind of the student; and that is, why a different number of volumes of H and C should be assigned to substances that have the same composition by analysis. The members of this class are all similar in chemical or empirical composition; consisting of six parts by weight of carbon combined with one of hydrogen, or as it is shown 85·71 per cent. of C and 14·29 per cent. of H. But there are different numbers assigned to each member in columns 3 and 4. A glance at columns 7, 8, and 13 furnishes an explanation. We find that, although butylene and hexylene have the same percentage composition as ethylene, yet they are respectively twice and three times as heavy. The weight of a cubic foot of ethylene is 519·12 grains; that of a similar quantity of butylene is 1038·24 grains; and of hexylene, 1557·36 grains. So that in butylene we have just twice as much, and in hexylene three times as much, carbon and hydrogen packed into a similar space as in ethylene. This is an important consideration in all matters dealing with questions relating to volume. As regards weight, however, it will be observed by column 16, that each member of the ethylene series requires, weight for weight, an equal equivalent of oxygen for its complete combustion.

It will be observed that in each case the sum of the small figures in column 2 is just double that of the sum of those in Nos. 3 and 4. Take methane, for instance, the constitution of which is represented by HC_4. This actually means H_1C_4, as, when no figure at all is used, one equivalent is implied; and the sum of the figures is $1+4=5$. In columns 3 and 4, we have $0{\cdot}5+2=2{\cdot}5$, or one-half of 5. So with hexylene C_6H_{12}. Here the sum is 18; and in columns 3 and 4, we have $3+6=9$, or one-half of 18. And so with regard to any other hydrocarbon in the list. In each case the complete molecule, as represented by the symbols in column 2, stands for two combining volumes of the gas.

Passing on to 5 and 6, it will be observed that the higher members of each series do not always contain a larger *proportion* of carbon by weight than the lower ones. They always contain, bulk for bulk, a greater *weight* of carbon as the series advances, as may be seen from the specific gravities in column 8; but that is another thing. In the methane series, the proportion of carbon gradually increases; beginning at 75 per cent. (see column 5), and going on to 80, 81·8, 82·7 per cent., &c. In the ethylene series, it does not alter; and in the acetylene series, the lowest member contains the highest *proportion* of carbon. The same will be observed in the case of the benzene series. So it must not be supposed that the greater the *proportion* by weight of carbon present in the compound, the higher will be its value as an illuminating agent, though there is reason to believe that the illuminating value improves with the *weight* of carbon present in each volume, or, in other words, with the density of the carbon vapour. We shall presently be in a position to see how far this is borne out by experiment.

The degree of density of the vapours, of course, determines the

Title. (1)	Symbol. (2)	Composition. By Volume. C (3)	By Volume. H (4)	By Weight. C (5)	By Weight. H (6)	Weight of 1 cub. ft. in Grains. (7)	Specific Gravity. Gas Air = 1. (8)	Specific Gravity. Liquid Water = 1. (9)	Condition at Ordinary Temperature, &c. (10)	Melting Point. Fahr. (11)	Boiling Point. Fahr. (12)	Volumes Oxygen required for each Volume. (13)	Volumes of Products. CO_2 (14)	Volumes of Products. H_2O (15)	Pounds of Oxygen required for each lb. (16)	1000 Volumes of Water at 60° absorb of the Gas— Volumes. (17)
Hydrogen	H					37·00	0·069		gas							(17) 19·0
Nitrogen	N					520·73	0·971		,,							14·8
Oxygen	O					593·13	1·106		,,							29·0
Air						536·28	1·000		,,							—
Carbonic oxide	CO	0·5				518·68	0·967		,,	−350	−310	0·5	1·0			24·3
Carbonic acid	CO_2					815·15	1·520	0·94	,,	−70						1000·0
Water	H_2O		1·0		11·1	333·67	0·622	1·000	liquid	−32	212					—
I.—*Marsh Gas or Paraffin Series* ($C_n H_{2n+2}$)—																Water at 32°
Marsh gas, Methylic hydride, light carb. hydrogen	CH_4	0·5	2·0	75·0	25·0	296·66	0·553	—	gas	—	—	2·0	1·0	2·0	4·00	54·5
Fire damp, Ethane, Ethylic hydride, dimethyl	C_2H_6	1·0	3·0	80·0	20·0	556·12	1·037		,,			3·5	2·0	3·0	3·73	94·5
Propane, Propylic hydride	C_3H_8	1·5	4·0	81·8	18·2	816·92	1·522		,,		4	5·0	3·0	4·0	3·63	insoluble
Butane, Butylic hydride, diethyl	C_4H_{10}	2·0	5·0	82·7	17·3	1075·24	2·005		,,		34	6·5	4·0	5·0	3·68	,,
Pentane, Amylic hydride	C_5H_{12}	2·5	6·0	83·3	16·7	1834·80	2·469	0·626	liquid		100	8·0	5·0	6·0	3·65	,,
Paraffins	$C_{17}H_{36}$ to $C_{27}H_{56}$	—	—	—	—	—	—	—	solid	100–140	—	—	—	—	—	—
II.—*Olefiant Gas or Ethylene Series* ($C_n H_{2n}$) Olefines—																
Olefiant gas, Ethylene, Elayl	C_2H_4	1·0	2·0	85·71	14·29	519·12	0·968		gas		−134	3·0	2·0	2·0	3·43	60·0
Propylene, Tritylene	C_3H_6	1·5	3·0	,,	,,	778·68	1·452		,,		−134	4·5	3·0	3·0	,,	440·0
Butylene, Dietryl	C_4H_8	2·0	4·0	,,	,,	1038·24	1·936		,,		23	6·0	4·0	4·0	,,	—
Amylene	C_5H_{10}	2·5	5·0	,,	,,	1297·80	2·419	0·654	liquid		100	7·5	5·0	5·0	,,	slightly soluble
Hexylene	C_6H_{12}	3·0	6·0	,,	,,	1557·36	2·904	0·699	,,		155	9·0	6·0	6·0	,,	insoluble
III.—*Acetylene Series* ($C_n H_{2n-2}$)—																
Acetylene, Ethine	C_2H_2	1·0	1·0	92·3	8·7	481·67	0·898	—	gas		—	2·5	2·0	1·0	3·07	1000·0
Allylene	C_3H_4	1·5	2·0	90·0	10·0	—	—	—	,,		—	4·0	3·0	2·0	—	—
Crotonylene	C_4H_6	2·0	3·0	88·8	11·2				liquid		66	5·5	4·0	3·0	—	—
IV.—*Benzene Series* ($C_n H_{2n-6}$)—																
Benzene, Benzol	C_6H_6	3·0	3·0	92·3	7·7	1445·27	2·695	0·883	,,	32	176	7·5	6·0	3·0	3·06	slightly soluble
Toluene, Tolnol	C_7H_8	3·5	4·0	91·3	8·7	1704·63	3·179	0·872	,,	—	232	9·0	7·0	4·0	3·13	,,
Xylene, Xylol	C_8H_{10}	4·0	5·0	90·5	9·5	1964·89	3·663	0·862	,,	—	282	10·5	8·0	5·0	3·17	,,
V.—*Naphthalene*	$C_{10}H_8$	5·0	4·0	93·75	6·25	2371·97	4·423	—	solid	174	425	12·0	9·0	6·0	3·00	insoluble

Note.—1 lb. = 7000 grains; 1 kilogramme = 2·2046 lbs.; 1 cubic foot = 1728 cubic inches; 1 cubic metre = 35·317 cubic feet.

specific gravity of the substances, as shown in column 8. Since carbon vapour is twelve times as heavy as that of hydrogen, its influence is more marked in that proportion. With regard to columns 10 to 12, it should be mentioned that the whole of the substances named in the table have been reduced to the liquid, and also to the solid condition, by combined influence of cold and pressure. Some require an enormous extent of these influences; others are reduced to the solid or liquid form by ordinary thermometrical and barometrical conditions. The three elements, methane, ethylene, acetylene, and other substances, require such a high degree of cold or pressure, or both combined, so far removed from ordinary atmospheric conditions, that, for practical purposes, they are called permanent gases. They may enter in any desired proportion into the composition of an illuminating gas, and be distributed to any practicable distance without risk of condensation. It will be observed that in each case the boiling point is lowest at the beginning of the series, and advances regularly with the increase of density. For instance, a temperature of 4° Fahr. is necessary to reduce propane to the liquid state; whilst the next member—butane—is condensed at a little above freezing point; and the next to that—pentane—remains liquid at any ordinary temperature, though, of course, its low boiling-point renders it extremely volatile.

When the boiling point begins to come within atmospheric conditions, as in the case of propane (34°), butylene (23°), or crotonylene (65°), the substance cannot be regarded, for practical purposes, as a gas, but as a vapour. When this is so, it can no longer be allowed to mix with the gas in any proportion, since it is only carried mechanically as in the case of water vapour. When the saturation point is reached, condensation takes place; and, as is well understood, this condensation is not limited to the mere deposition of the excess of vapour, but a proportion of other substances, which would otherwise remain in the gas, is carried down. It has been found in practice that a gas that has been too highly carburetted, by being charged with vapours of naphtha or such-like substances, and has consequently deposited some of its burden in the distributing-pipes, was really worse in quality at the burner than before it was brought in contact with the carburetting material. A substance that may be regarded as a permanent gas is therefore greatly preferable to the gas engineer, than a "vapour." But it happens that the "vapours" comprise the most valuable illuminating agents; and therefore their assistance is by no means to be despised. Even the limited quantity of "vapour" that a gas is capable of retaining at 32° or less has an important influence on its value as an illuminating agent.

Referring to column 7, it will be seen that hydrogen, methane, and ethylene, which enter largely into the composition of illuminating gas, are amongst the lightest of the bodies named. Their weight ranges from 37 to 520 grains per cubic foot, or considerably under that of the atmosphere; hydrogen being especially marked in this respect. Other of the hydrocarbons extend to three or four times the weight of the atmosphere, and therefore, though perhaps small in respect to percentage by volume, they may form an important proportion as regards percentage by weight of the gas. Ordinary coal gas weighs about 230 grains per cubic foot; and therefore some hydrocarbons, such as pentane, amylene, and benzene—are about six times as heavy. Naphthalene is ten times as heavy. One per cent. by volume of benzene or naphthalene would represent 6 or 10 per cent. by weight, respectively; and if coal gas contains, as has been alleged, 2 per cent. or more of benzene vapour, such would constitute $\frac{1}{5}$ part of the gas by weight. This helps us to understand the important effect of even a trifling percentage of heavy hydrocarbon vapour on the value of gas.

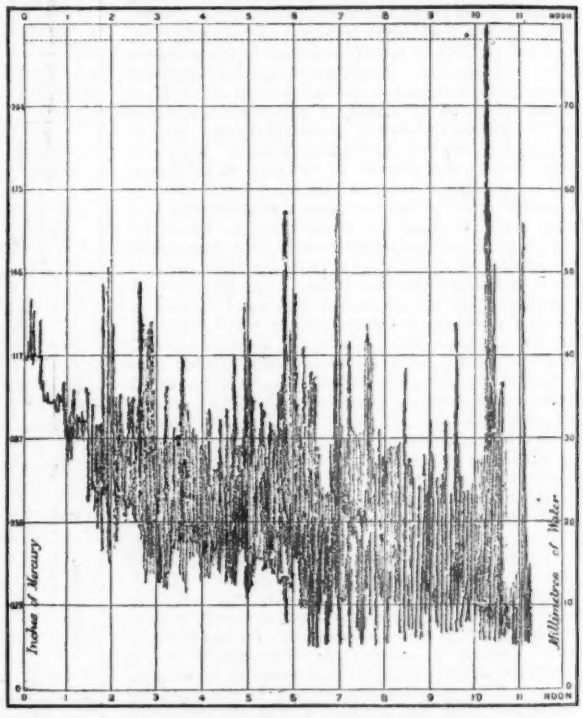
Columns 13 to 15 depend, as has been shown, upon columns 3 and 4. Each volume of carbon will require two of oxygen, and each volume of hydrogen half a volume of oxygen, and will form two volumes of carbonic acid, and one of water vapour respectively. The data in these columns are, therefore, related to each other in simple arithmetical ratios. Twice (3) + $\frac{1}{2}$ (4) gives (13). Twice (3) gives (14); and the figures in (4) and (15) are identical. In column 16 is shown the weight of oxygen required for combustion by each unit by weight of the different substances. It is interesting to notice that this starts with 8 lbs. for pure hydrogen; falls to 4 lbs. for methane; and more gradually to 3 lbs. in the case of the heaviest on the list—naphthalene. Each pound of carbon requires $2\frac{2}{3}$ lbs. of oxygen; and each pound of hydrogen, 8 lbs. So the oxygen requirement is largely influenced by the proportion of hydrogen present in the compound. The last column (17) explains itself; but it is desirable to notice that this refers to the pure gas, and is greatly modified by dilution with insoluble gas. Take carbonic acid, for instance, which is far more soluble than the hydrocarbons, with the exception of acetylene. Yet it cannot be removed from the gas by the most liberal treatment with water. Such is also the case with regard to sulphuretted hydrogen, which is three times as soluble as carbonic acid. Therefore, with the exception perhaps of acetylene, the co-efficient of solubility is so low that, considering the small percentage in which most of these bodies are present, no reasonable amount of liquid purification is likely to prejudice the quality of the gas by washing out some of the hydrocarbons, though vapours that would be condensed in any case before reaching the burner may perhaps be removed.

At the meeting of the London County Council last Tuesday, Mr. Alfred W. Stokes, F.C.S., was appointed one of the Gas Examiners for the Metropolis.

A LEAF OUT OF THE DIARY OF A GASHOLDER.

By W. Mann.

There are doubtless many of the readers of the Journal who recollect the terrible volcanic eruption which took place at Krakatoa, an island in the Sunda Strait—the great marine highway between Java and Sumatra—towards the close of August, 1883. On the 26th of that month there occurred on that island a subterranean convulsion which, in its destructive results to life and property, and in the startling character of the effects to which it gave rise, is perhaps without a parallel in historic times. By the force of the eruption about two-thirds of the entire island was destroyed; and, by the succession of great waves which followed, the towns and villages on the Strait were overwhelmed, while the sea was encumbered with enormous masses of floating pumice. Familiar landmarks were swept away; and islands appeared in places where they had not previously existed. This remarkable occurrence was made the subject of special investigation by a Committee of the Royal Society, whose elaborate report—a quarto volume of nearly 500 pages—recently issued under the editorship of Mr. G. J. Symons, F.R.S., is a testimony of the vast amount of labour bestowed by them on the subject. In it we have all the information that could possibly be collected in regard to this disaster; and exceedingly valuable it is. It is not my intention to trouble your readers with any kind of abstract of the contents of the book; but there is one matter in it to which I think their attention may be usefully directed. The effect of the great atmospheric disturbance which accompanied the eruption was felt at Batavia, situated 83 miles, in a straight line, from Krakatoa; and, curiously enough, the holder in the gas-works in that city has furnished us with an abiding record of this terrible event, when all around was terror and dismay. The accompanying diagram, which is a reduced copy of a portion of the pressure recorder on the holder, shows the pencillings on the 27th of August;



and I send it to you not only because I think it curious and interesting to us who are specially concerned with the supply of gas, but because I think it will be seen and read of when gasholders and gas-works will have become things of a long past. The earth is not likely to have done with these volcanic manifestations for many ages to come. The habit is as old as the hills, and will long abide. Vulcanology, too, will continue the account of such awakenings; and some page of its records will surely contain this gasholder testimony of the Krakatoa explosions, which caused such upheavals of the atmosphere over the vicinity of the disturbance, and the formation of air-waves, which, rolling away as such, produced the excessive pressure on the gas in the Batavia holder, so plainly indicated by the sudden rise of the pencil of the pressure recorder, especially the one soon after ten o'clock, nearly 100 miles away; Doubtless this was the blast, with detonations, which finished the blowing away of the two-thirds of the island—in solid measure more than a cubic mile. I say "finished" the blowing away of that portion of the island now missing, because no doubt the explosions which had taken place before, with great air disturbance, indicated by the diagram, had done a great deal of the work of disintegration.

Although the terrible state of affairs represented by the pressure diagram took place during the forenoon of the 27th of August, and is of the most impressive importance, yet the diagram of the previous day was of use to the Committee—it having

recorded with equal reliability the signs of the approaching culmination; for we read that "during the early eruption in May"—this being the month in which the first manifestations of the returning activity of the volcano took place—"and up to August, no remarkable movement of the water was observed. The violence of the explosions recommenced during the early afternoon of the 26th of August; a particularly heavy detonation being heard about 17.30 on that day. This was marked by the pressure-gauge at the gas-works at Batavia at about the same time." Then again we are told that "at about 6 hrs. 30 mins." on the 27th of August "a wave swept away nearly the whole of Anjer; and this was followed at about 7 hrs. 3 min. by another, which completed the destruction. At the same time the lower part of Telok Betong, in Sumatra, was overwhelmed. Two heavy air-waves are recorded on the gas-pressure gauge at Batavia at 5 hrs. 45 mins. and 6 hrs. 57 mins., which are probably connected with the explosions causing these waves." With reference to the precise moment at which the great explosion took place, the gasholder record is thus referred to: "The probable moment of the great explosion was 2 hrs. 56 mins. Greenwich mean time, or 9 hrs. 58 mins. local time. A corroboration of the conclusion thus arrived at is afforded by the register of the gasometer indicator at Batavia, which fortunately is available, and which, in the absence of a continuous barometer record, supplies a fairly trustworthy indication of the atmospheric pressure at the time in question." In a foot-note it is stated that, "on the original, the trace at about 10 hrs. 15 mins. passed beyond the limits of the diagram; and it is quite possible that the atmospheric pressure on the gasometer at that moment may have been sufficient to have caused the pencil to rise even higher than it did, had the construction of the recording apparatus allowed of its doing so. The figures on the right of the diagram give the indicated pressure on the gasometer in millimetres of water, while those on the left give the equivalent pressure in inches of mercury."

We have many records of destruction by flood and fire; but we have few on which so much reliance can be placed in respect of detail as this—it being the outcome of such careful and exhaustive inquiry. Consequently, when we read that forces were in action during a portion of the 26th and 27th of August, 1883, which blew more than a cubic mile of the island of Krakatoa, seven miles away, in such huge portions as to form, by falling into the sea, waves of a magnitude sufficient to overwhelm the shores of Java and Sumatra, and drown 36,000 of the inhabitants of the coasts, while the wave which followed the great explosion that left its mark on the pressure diagram, soon after 10 a.m., carried a man-of-war more than a mile-and-three-quarters inland, and there left her high and dry 30 feet above sea-level is, I feel, something to realize, leaving all the other strandings out of the question. Yet, there it is, and we must believe it, and so will future readers, because the source of information will always be connected with the story.

Finally, in order that the managers of gas-works may be able to judge the scratchy condition of the diagram by their own experience of the effect of high winds upon gasholders, it should be stated that during the whole of the day of the 27th of August, 1883, but for the terrible nature and effects of the eruption, the storm that raged would have been considered of a very furious type—in fact, tremendous. We have heard of certain effects produced upon the holders at Beckton by air-waves generated by the firing of heavy guns on Woolwich Marshes, only a few miles off; but we never heard of a gasholder there being pressed down by one so deeply into its "well," as it is called, as to jump out when relieved, and allow gas to escape. This was the case at Batavia, and is duly recorded in the Committee's report.

Universal Cookery and Food Exhibition.—Under the management of a Committee largely composed of *chefs* attached to various clubs and other establishments at the West-end in which cookery is cultivated as a fine art, an interesting exhibition of cooking and foods has been open during the past fortnight in the Duke of Wellington's Riding School, Knightsbridge. It consisted very largely of food preparations, solid and liquid, beverages, and condiments not differing in any noteworthy respect from those that are to be seen at most exhibitions, although there were perhaps more exhibits of the perishable edibles generally figuring in pastrycooks' shop windows than are to be found at shows of a less transient character. The most noticeable feature of the exhibition was the extent to which gas-stoves were patronized by the cookery professors. One end of the hall was occupied by a range of gas-stoves, chiefly supplied by Messrs. W. Sugg and Co., Limited (who received a gold medal for their exhibit), upon which demonstrations of high-class cookery were made daily, during the course of the exhibition, by eminent *chefs* and lady lecturers. A very admirable part of the programme was a series of cooking competitions, in which many children from Board schools, orphanages, &c., took part—illustrating the advance which the teaching of useful knowledge has made of late years in educational establishments for girls. The work of the children, as of the professional demonstrators, was carried on under the closest inspection, and the results were displayed each day. Messrs. R. and A. Main, of Glasgow, also showed some of their useful gas-kitcheners in the hall; and gas-ovens were exhibited by the Wilson Engineering Company. The lighting of the hall was materially improved for the occasion by the addition of numerous examples of Messrs. Sugg's "Cromartie" gas-lamps.

Technical Record.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Spring Meeting of this Association was held last Thursday at Ramsgate, under the presidency of Mr. J. Somerville, Engineer of the Bankside Station of the South Metropolitan Gas Company. The party, numbering about fifty, left Victoria Station at 9.45, in two saloon carriages, for the popular seaside town, where they arrived at 12.40, and were met by Mr. W. A. Valon, Assoc. M. Inst. C.E., the Engineer of the Ramsgate Corporation Gas and Water Works, Mr. George Cockburn, the Accountant, and several gentlemen who had arrived from other towns direct. The company then proceeded to the Granville Hotel, where luncheon was partaken of by kind invitation, after which the Chairman of the Gas and Water Committee (Alderman W. F. Pygott, J.P.), in the absence of the Mayor, who was unable to be present, addressed to the members a few remarks, welcoming them on their second visit to the town. In the course of his observations, he said that he hoped they would make their visit a profitable one, as he had no doubt they would, seeing that Mr. Valon had something to show them which they had never seen before, and which would doubtless prove advantageous to them.

General Business.

The general business was then transacted; and the following three gentlemen were unanimously elected members:—Mr. F. G. Dexter, of Wantage; Mr. T. Price, of Hampton Wick; and Mr. W. G. Hicks, of Ramsgate.

Mr. Valon next read the following paper on

Brin's Oxygen Process of Purification.

Mr. President and Gentlemen,—In the name of the Mayor, the Chairman of the Gas Committee, and the Aldermen and Councillors of the borough, I welcome you on this your second visit to Ramsgate. Your first visit was an honour we all appreciated; your second visit to-day we all look upon not only as an additional one, but an accentuation of that conferred upon us in 1882. On the occasion of that visit, which took place during the presidency of our esteemed friend, Mr. Charles Gandon, we had to show you our new water-works just completed; and what was thought at that time of some interest—viz., our generator furnaces, the gas-works having just undergone reconstruction. To-day we have to deal with the gas-works only; and more particularly that part in which the purification of gas from sulphur is conducted.

Amongst those here to-day are many who favoured us with their company in 1882; and those gentlemen will find that we have made what I venture to think they will regard as some improvement in the general arrangements. At that time we were using anti-dips; and although I was one of the first to employ an arrangement for unsealing the retorts while in action, we have, after careful trial and experience, discarded anti-dips in favour of the old kind of dip in a modified form—viz., by an arrangement by which they are sealed lightly in liquor—the tar being forced out from the bottom of the hydraulic main by the weight of water; the inconvenience and difficulty of working an anti-dip not being in my opinion compensated for by any corresponding advantage. "Hot condensation," as my friend the President calls it, or the abstraction of the tar while the gas is at a comparatively high temperature, is still in use here as it was in 1882, and in the same form—viz., by placing wire screens in the foul mains running round the retort-house at frequent intervals, leaving a space of 2 or 3 inches at the lower part to allow the tar to run off freely. These screens, from the constant passage of the warm tar, keep themselves perfectly free from deposit—a result I did not expect when they were inserted. Indeed, I anticipated that frequent cleansing might be a serious drawback to their use; but it is not. The furnaces you have, I think, from time to time heard enough about. But they are still further simplified, having finally resolved themselves into a square fire-brick box with a hole at the bottom; and if time permits, you will be able to judge of them for yourselves.

I now come to the special object of your visit. When first asked by your President, about six weeks since, if I should be able to receive you at Ramsgate for the purpose, I feared time would beat me; and I should just then have preferred a visit later on, as all depended on our temporary installation for making oxygen on the works going off smoothly. But this it has done; and I am glad to show you what has been accomplished in this direction. In June last we had completed certain practical experiments with practical results at Westgate-on-Sea. These were accomplished by means of oxygen compressed in cylinders, and did for temporary practical experiments. But for every-day purification, oxygen must be made on the works; and it is this I am now able to show you in operation.

The steel tubes containing the barium are inserted in ordinary retorts past making coal gas, heated by an ordinary gas-furnace; and in this way we produce what we want from day to day for purification. These steel tubes are coupled up to an air-pump having a small circular lime and caustic soda purifier between them; a small 40-feet gasholder being on the outlet or delivery-pipe from the pump to receive the oxygen. This is connected to the meter regulating the supply to the back of the exhausters; and that ends the apparatus. This arrangement has been temporarily erected, and will not be depended upon for a permanency. The size of the oxygen holder will need increasing so

as to be large enough to hold a day's consumption; and the air-pump should be in duplicate, and tubes not in use in reserve. But I think, on inspection, the simplicity of the whole thing will appeal to you in such a pointed manner that you will see its amplification means very little, and will only add to its efficiency without in any way involving complication.

We now come to the purifiers, of which there are four in all—14 ft. by 14 ft. by 4 ft. 6 in.—each containing four trays, on which at the present moment the lime is spread 9 inches deep; the gas passing through three purifiers only. The first of these purifiers was turned on on April 24; and at the same time oxygen was added to the gas in the proportions determined upon at Westgate-on-Sea—since which time we have been working continuously, passing through about 300,000 cubic feet per day. The outlet of No. 2 this morning showed only a trace of carbonic acid (CO_2)—not a measurable quantity—and under 10 grains of sulphuretted hydrogen (H_2S). The crude gas contains 688 grains of carbonic acid, and 500 grains of sulphuretted hydrogen. No. 1 shows 664 grains of carbonic acid, and 440 grains of sulphuretted hydrogen. It is needless to say that No. 3 is still practically a clean purifier, and proves beyond doubt that No. 1 will be thoroughly fouled for both sulphur and carbonic acid ten days before it would be absolutely necessary to change it to allow it to take its place as third in the series. It is only right to add also that the lime we are using, which has been purchased hurriedly, is of a very poor quality. Having been tested, it shows considerably under 50 per cent. as caustic. These points are called to your attention so that you may note the quick action set up by the oxygen. I may also mention that the sulphur in all forms has remained at 8 grains with very little variation. I hope to give further tabulated figures and results at The Gas Institute meeting in June.

For your observation, we have fixed Harcourt's colour tests on the outlet of the purifiers, and shall be glad if some of the members would kindly use these to satisfy themselves inferentially of the purity of the gas. There is also a Referees' test, by which the whole products from the burning of 10 cubic feet have been collected and left under the condenser ready for some gentleman to examine, and I should be further obliged if someone would take it and analyze it (my assistant will help if desired), and say how many grains of sulphur they find per 100 cubic feet. Perhaps someone will also kindly test the illuminating power. The heats you will see for yourselves; and no cannel has been used since oxygen was first mixed with the gas. These are favours which I hope will be granted; and to secure them I would ask any two gentlemen to undertake the two tasks before we proceed to the works.

It is our intention to raise the lid of each purifier for your inspection, so that you may see the lime in all stages from clean until it is used up. I do not use the word "foul," as in no stage of its transmission from lime to carbonate does it deserve that name. It can at any time be removed from a purifier and left exposed on the premises without the slightest nuisance arising therefrom.

Gentlemen, as our time is short, I will bring to a close this memorandum (it cannot be dignified by the name of a paper), feeling sure that you will be more interested in what you will see than in hearing me read, especially as I shall need to talk somewhat in explaining matters on the works, and shall be further happy while there to answer any queries you may wish to put.

At the conclusion of the paper, it was proposed by Mr. Gandon, of Lower Sydenham, and seconded by Mr. W. H. H. Broadberry, of Tottenham, that a vote of thanks be given to Mr. Valon for his interesting paper.

The party afterwards proceeded to the gas-works to inspect the apparatus, &c., used in the manufacture of oxygen. On their arrival, the retort-house was first visited, and the gas generators and the machinery for drawing and charging the retorts inspected. Mr. Valon then briefly described the mode of making oxygen. He remarked that the tubes were simply made of steel, 5 inches in diameter, screwed so as to make them perfectly air-tight. These were filled with barium, and connected up to an air-pump, which they would afterwards see when air was pumped in, and the gearing reversed and oxygen pumped out. The heats they would see for themselves, which were maintained during the whole operation. Some time ago, it was thought by Messrs. Brin and Co. that it was impossible to work without alternating temperatures; but he had found out that it was quite possible—indeed, it was better to do this. The wear and tear was reduced; and the only thing that could possibly get burnt out were the tubes; but these were reasonable in cost, amounting to about £2 each. The only expensive part was that of the barium; but this lasted a considerable time. In answer to a question, he remarked that the actual life of the barium had not yet been ascertained. At Ramsgate it had been in use since the commencement of the installation; but at Westminster it had been in use for more than two years, and was still in good working order. Mr. Valon was asked the amount of oxygen he was making; and, in reply, said at present they were only producing about 1600 cubic feet per day, or about ½ per cent. on the make of gas. The plant would, however, produce more. Of course, as he had already observed, it was simply a temporary installation, and in a permanent one everything would be in duplicate, so as to allow for a breakdown. The tubes in future would be (say) 7 or 8 inches in diameter, instead of 5 inches as at present, because his experience showed that better results were obtained thereby. It had struck him suddenly to put tubes in the retorts, which both answered the purpose and saved time; but in future the retorts would be cleared away, and the bed utilized for the tubes only, which would, of course, allow more to be placed in the same space. The present make of gas was about 300,000 cubic feet per day. He had tried 5 per cent. of air as against ½ per cent. of oxygen, and the only difference was that the purifiers were multiplied and also the space; and instead of getting the whole of the sulphur fixed as at present, a large quantity appeared in the old form of sulphide. The members then proceeded to the building, where the pump was in operation, and the lime and caustic soda purifiers, meter, and gasholder were erected. Here they were shown the mode of pumping in the air and pumping out the oxygen by the same pump, by simply reversing the gear. This reversing, Mr. Valon said he anticipated would be done automatically in future, as Mr. Murray (of Brin's Oxygen Company) had invented an arrangement for this purpose. The quality of the oxygen was also tested; and some experiments shown with regard to blowing off at the relief-valve. In answer to a further question, Mr. Valon said that they now pumped in the air for five minutes and out for the same period. The pressure they were working at was 15 lbs.; and the valve was weighted to that pressure. The small circular purifier was filled with ordinary lime to dry the air; and the smaller one with caustic soda. His experience was that a lime purifier would pass many thousand cubic feet without the necessity of changing. With regard to the quality of the oxygen, he said that at Ramsgate it was 90 per cent. of purity; but at Westminster 98 per cent. pure oxygen was made, and 95 per cent. was the average. What he wanted the members to see was the simplicity of the arrangement, which merely meant the pumping in of air through red-hot tubes and pumping out oxygen. The purifier-house was then inspected, where Mr. Valon had marked on the lids of the boxes the condition of the material as stated in his paper. With oxygen purification he said the sulphur and carbonic acid kept side by side, so that when one was taken out, the material was thoroughly spent for the other. As would be seen, the sulphur was fixed in the solid form. No. 1 purifier was then opened, and the material examined. Questioned by Mr. Geo. Livesey, Mr. Valon said that this purifier had been in use since April 24; and, under the old system, it would have been fouled in about ten days. As it was, however, the material would have lasted some days longer before being thoroughly spent. Replying to Mr. C. C. Carpenter, he said that they worked upwards; consequently the bottom trays would be more carbonated than the top one. This was found to be the case when the material was turned over on each tray. It was asked whether the purifiers had been opened since the time oxygen had been added to the gas; and Mr. Valon informed his questioner that they had not. He felt certain from the experiments at Westgate what the state of the material would be. Interrogated as to the chemical reactions taking place in the purifier, Dr. L. T. Thorne (of Brin's Oxygen Company) said it would be folly to dogmatize thereon, inasmuch as there was little doubt that the reactions were very numerous and varied. It was probable that part of the sulphuretted hydrogen acting on the lime formed calcium sulphide and sulpho-hydrate. These latter uniting with the carbon disulphide and other sulpho-carbon compounds would form sulpho-carbonate, and other sulpho-carbon derivatives of lime. The last-named compounds would then be in part oxidized by the oxygen employed, partly to oxy-sulpho derivatives of lime, partly to free sulphur and carbonate and hydrate of lime, the hydrate being then ready for a repetition of a similar series of reactions. It was also likely that some direct oxidation of the sulphur compounds present in the gas, by the oxygen, occurred. Nearly half the sulphur found in the spent lime was in the free state; the remainder being present as sulphide, sulphate, sulphite, and hyposulphite of lime. More than half the lime was present as carbonate; only very little hydrate being left. The increased illuminating effect of the gas obtained by the oxygen process was due to its still retaining a small quantity of the oxygen employed, which increased the temperature of the flame, and consequently its luminosity. Where air was used for revivifying the purifiers, the illuminating power of the gas was reduced by the residual nitrogen. At the close of Dr. Thorne's remarks, the lid of No. 2 purifier was taken off; and although only one-third carbonated, no smell was perceptible. In reply to further questions, Mr. Valon said that 12 yards of slaked lime was in each box, and the coal used was Pelaw Main. Mr. Livesey remarked that the purifier looked very much like an ordinary lime purifier; but he supposed it was better carbonated. Mr. Valon replied that it might look so; but it was not. It was generally agreed, however, that there was no smell attached to this form of purification in either stage; and at Mr. Valon's request several members of the Association went into the purifiers to satisfy themselves on this point. This completed the inspection of the plant.

The Dinner.

The members, with the friends present, subsequently dined together at the Granville Hotel. After the repast, the President proposed the toast of "The Queen," which was heartily received. In proposing "The Corporation of Ramsgate," with which he coupled the name of the Ex-Mayor (Mr. J. Kennett, J.P.) and the members of the Gas Committee, the President said that they had to thank Mr. Alderman Pygott, the Chairman of the Gas Committee, for the kind reception he had given them, and also the Committee, especially for the privilege they had enjoyed in being allowed to inspect the gas-works. Mr. Kennett, in responding

thanked the members sincerely; for, he said, it was a great pleasure to them to have gentlemen of their skill and ability amongst them. He and the other members of the Council had every reason to be proud of their Engineer, Mr. Valon; and he assured those present that the Corporation were not behind any other Corporation in recognizing his merits and the work he had done. He wished the Association every success. Alderman Pygott, in proposing "Success to the Southern District Association," remarked that he took it that gas had become a necessity; and he hoped it would be for a long time to come, seeing that at Ramsgate the works were the property of the ratepayers, for which they had paid and expended £106,000, and, thanks to their Engineer's efforts, they had been able, not only to meet their expenses, but to hand over an amount to the district rate last year equal to 4d. in the pound—the price of gas being 3s. 2d. per 1000 cubic feet. The President having responded, the health of Mr. W. A. Valon was proposed, and enthusiastically received; and, in response, Mr. Valon thanked the members for having visited Ramsgate. It was very nice, he said, to have Engineers visit them sometimes—severe critics, who asked many questions. It was all very well to hear a paper read; but it often took two or three months to master. He considered it a great advantage if they could inspect the practical part of the work. He expressed the opinion that they had but little more to do with regard to oxygen purification, beyond amplifying the apparatus. He could see nothing that was likely to give difficulty. It would, of course, be necessary to have duplicate apparatus; but this was an easy matter. He merely wished the members to know that what he had said to them was simply the truth as it had come to him from day to day; and he hoped that, for many years to come, he might have the opportunity of inspecting with them works of a similar kind to that which they had seen on the present occasion. The health of the Secretary of the Association (Mr. J. W. Helps) was then proposed, and acknowledged in suitable terms.

This concluded the business of the day; and the return journey to town was made at 7.30.

THE SANITARY INSTITUTE.—Mr. G. W. Hastings, M.P., has accepted the presidency of the annual congress of this Institute, to be opened at Worcester on the 24th of September next.

A NEW WASHER-SCRUBBER.—Messrs. Kirkham, Hulett, and Chandler, Limited, have lately introduced a new patent washer-scrubber which cannot, we think, fail to considerably enhance the success which has hitherto attended their operations. The appliance has been tried by The Gaslight and Coke Company, who have practically testified their appreciation of its value by placing a second order in the hands of the makers.

THE PROPOSED FIRE-BRICK SYNDICATE.—The efforts of the promoters of a fire-brick syndicate have not yet been crowned with success, and (according to *Industries*) there seems some likelihood that their plans for controlling this branch of industry will be frustrated. In the meantime, aided partly by a legitimate increase in demand, and partly working on the expectation of the results of the formation of a syndicate, the Staffordshire fire-brick manufacturers are obtaining much higher prices for their commodity than was the case last year. About 60s. per 1000 is the price now, delivered in North Staffordshire, for best Stourbridge fire-bricks; fire-clay being about 16s. per ton.

GAS AT THE PARIS EXHIBITION.—Notwithstanding the lavish use of the electric light at the Paris Exhibition, gas, consumed in the most improved burners, will make a conspicuous show; and an important installation of their lamps is being carried out by the Wenham Company. In the Gas Pavilion (plans of which were given with the JOURNAL for the 12th of March), there are four ventilating lamps in the kitchen, five in the exhibition hall, a beautiful cluster of thirteen lights in the library, and a luminous ceiling in the dining-room. In the Brasserie Tourtel there are two luminous ceilings, eight ornamental glass lustre lamps, and 51 outside lamps. Messrs. Spiers and Pond's establishments—the grill-room and offices, the Criterion Restaurant, the Ceylon Restaurant, and the Bovril bar—will all be lighted by Wenham lamps; as will also the Anglo-American Restaurant on the Eiffel Tower, the restaurant in the centre of the building, Duval's Restaurant, the Panorama of Paris, all the kiosks, and all the lavatories.

MIDLAND ASSOCIATION OF GAS MANAGERS.—The programme for the spring meeting of this Association, which is to be held at the Royal Hotel, Matlock Bath, next Thursday, under the presidency of Mr. Charles Taylor, of Derby, has been issued by the Honorary Secretary (Mr. J. S. Reeves, of Bilston). The members will assemble at Derby, where, by the kind permission of Mr. S. W. Johnson, M. Inst. C.E., the Locomotive Superintendent of the Midland Railway Company, they will inspect the locomotive works of the Company; afterwards visiting the Litchurch works of the Derby Gas Company. Shortly after noon they will start, in carriages provided by the President, for Matlock Bath; passing through Derby, Duffield, and Belper. The business of the meeting will comprise a paper on "Water Gas," by Mr. J. Ferguson Bell, of Stafford; and one on "Some of the Causes of Unaccounted-for Gas," by Mr. W. T. Tew, of Warwick. At the conclusion of the proceedings, the members and visitors will be invited to dine with the President. The subjects to be brought before the meeting are both of special interest; and the visits and drive should go to make up a thoroughly instructive and enjoyable day.

LIGHTING IN RELATION TO HEALTH.

In the paragraph which appeared in the JOURNAL last week announcing the inauguration of a Health Congress at Hastings on the previous Tuesday evening, we notified the fact that an address was delivered before Section B by the President, Major-General C. E. Webber, C.B., R.E., in which he dealt with the above subject; and, through the kindness of an esteemed correspondent, we are able to give some extracts from this sectional address.

In alluding in the first place to the duties of the Sanitary Engineer, Major-General Webber said that, although he may believe his mission to be confined to the prevention of the actual causes of disease, if he desires to study all that contributes to life or living, he should study the engineering of all those demands which affect the daily life of the public. "It is," he observed, "a narrow view of his duties to limit his work to that of an Inspector of what are ordinarily called 'nuisances'! My conception of the range of his inspection is that he should to a certain extent regard everything in connection with supply—whether of heat, light, power, or ventilation—as coming under his ken. I do not mean that he can be an expert on all these things; but he ought to be able to form an opinion on all questions appertaining to public safety, no matter what the nature of the supply or demand may be." To illustrate his meaning he referred to the supply of gas, water, steam, electricity, and hydraulic power; remarking that we find, "although the legislation granting powers to supply such things is often carefully laid down and described, still, owing to the want of knowledge of first principles, sometimes encountered amongst municipal officers, that the control which it is only right should be exercised is absent, and all sorts of abuses rendered liable to arise. Although the local surveyor may be an expert in making roadways and in sewage questions, he is not expected to have any acquaintance with the soundest conditions under which supply should be conducted. He need know very little of what is going on under the roads, though he knows all about their surface maintenance. For instance it is known that, in the case of the distribution of gas, the leakage from the pipes in early years amounted to as much as one-fourth of the whole amount produced. The gas thus wasted escaped into the surrounding soil, saturated it, and created in it insanitary conditions, which were often the cause of mischief. However, I believe I am right in saying that such a possible nuisance was not contemplated in the original Gas Acts; and even if the local authorities had been advised by their engineers of the existence of such a state of things, they had no power to interfere. I have frequently been present when, during the excavation of ground in the neighbourhood of old gas-mains, the odour from, and appearance of, the soil has closely resembled that which would be produced by the presence of sewage. On the other hand, I have known cases in which the local authorities, perhaps acting under the advice of their expert officers, have regarded the influx of systems for the distribution of all sorts of services as a matter simply of profit and relief of the rates, and have had no desire to obtain any statutory authority over the working of such systems, so far as the taking up of the streets, and the manner of the execution of the work, was concerned, in the sanitary interests of the ratepayers. The more such systems exist in a town, the more the surface of the roadways is liable to disturbance, not only in order to repair the conduits of each system, but also in order to repair the damage caused by the working of the one or the other." The improved means of constructing roadways—by asphalte and woodpaving—were alluded to next, and the increased inconvenience and cost of disturbances pointed out. Subways he advocated as the best means of relief, but they were costly; and foresight on the part of local authorities able to borrow to carry out municipal improvements would for a long time be likely to devote the capital raised under these powers to more pressing works. At the same time, it could easily be shown that if the first systems of water and gas supply and the sewage in many streets had been laid once for all in a subway, the actual economy in maintenance and repairs, as well as the saving of waste, would have long ago paid a high rate of interest on the outlay.

Proceeding, Major-General Webber said that the history of the growth of the distribution of lighting gas was one which could not even be epitomized within the limits of his address; but he observed, in passing, that it would indeed be an interesting subject if anyone could compile the statistics of the resultant benefits which this industry had conferred on mankind, especially those which would bring out the value of the labour saved in economical productions, the increased employment given, and the actual rise of total wages earned by the individual—all more or less due to the existence of a "cheap and efficient illuminant." In its early days, gas lighting had to compete with lamps and candles only. The applications of its great rival—mineral oil—were not understood; and though, like other innovations, it had to overcome a large amount of prejudice, it did not encounter the rivalry of existing fairly efficient means. The benefits and advantages it conferred at the time were immeasurably in advance of other means of lighting then existent. With many of the objections to its use, as valid and well known then as now, it had so many predominant advantages that the demand for it soon overtook the supply. Under these circumstances, a kind of monopoly had sprung up, for want of far-reaching legislation when the early Gas Acts were passed. Although a monopoly was created in some cases, it must not be supposed, he said, that the public

had suffered everywhere; and he instanced the gas supply in the City, where, owing to short hours, the conditions of time of consumption were such as to be a less attractive investment to the suppliers than in others. In this connection he said: "Originally there were three Companies. Previous to 1823 these Companies 'skirmished' about, and laid down their pipes wherever they could. Probably no one believed in it, and the Commissioners of Sewers of those days paid little attention. In 1823, however, the three Companies had separate districts allotted to them within the City. No doubt the whole thing was regarded as an experiment, but sufficiently hopeful to justify some control being exercised, and competition in digging up the same streets being prevented. This state of things remained in force till 1848; but in spite of the absence of direct competition, the price of gas in the City of London fell from 15s. to 6s. per 1000 cubic feet. Since 1848, there has been a gradual process of amalgamation going on between the supply Companies; still the price of gas has steadily fallen, until now it stands at about 2s. 9d. [? 2s. 5d.] per 1000 cubic feet. The outcry against so-called monopoly has proved to be unreasonable. If competition in the same street and to supply the same house had been encouraged by the local authorities in those early days, nothing but defective service, bad work, and loss of capital-producing speculation would have arisen; and gas supply would not have been in the position it now holds, and the enormous benefits its use has conferred on the community would have been lessened. The check on excessive profits established by Parliament, by which, after certain remuneration has been reaped by the shareholders, the consumers also share in the profits by a reduction in price, works in a satisfactory way. If Parliament had also regulated the questions of quality and purity as thoroughly as, for instance, has been done by the Municipality of Paris, in their regulations of 1850 (I think), nothing would have been left to be desired. While it has been our national good fortune to be the experimenting ground for such an industry as that of gas supply, the advantage has not been without its drawbacks . . . . . The history of the results of imperfect and experimental work in the early days of gas supply in this country would probably show the source whence the regulations compiled by all the other authorities in Europe were drawn. For instance, the precautions against the chances of leakage, especially within doors. I know that this branch of the subject received careful consideration from the municipal engineers and advisers when gas supply was first proposed in France. The rate of normal escape of gas indoors can be minimized; but there is no doubt that there have been in the past, and, in spite of all improvements, there are still, thousands of instances in which it has been either permanently or intermittently abnormal. In regard to comparison with its great rival illuminant —viz., mineral oil—this consideration of leakage, when not in use, of coal gas into the atmosphere of dwellings and workshops is of great importance. The question of the creation of the products of combustion when in use is common to both. Considering the combustible nature of hydrocarbon illuminants, the statistics would probably show a marvellous degree of immunity from accident and fire. The very exceptions prove the rule. Some will recall the extraordinary appearance of a group of streets in the Bloomsbury district of London, in the winter of 1878-9 (I think), after an explosion had occurred in the mains. They looked as if a huge steam-plough had torn up the roads, leaving a yawning trench throughout their lengths of many hundred yards. Fortunately for the Gas Company, no lives were lost; and hardly anyone injured. The streets were not important thoroughfares. Had it occurred, however, in the West End, the outcry might have been difficult to allay. From a sanitary point of view, the use of gas assumes a special position, and requires careful handling. The gas companies are not in any way responsible for the use to which the gas may be put by their customers. If all the fittings and pipes in a house are leaky, if all the burners allow more gas to escape unconsumed than they burn, the suppliers need not even be aware of it. On the other hand, the larger the quantity registered in the customer's meter the better for them. To counteract this possible injury to health, which no doubt is of a very insidious kind, we find opposing forces—First, the amount of the quarterly gas bill; second, the spread of public demand for all those useful little inventions of regulating the supply and consumption of gas, whether for light or heat; and, lastly, the good sense from a commercial point of view of many gas companies in spreading information amongst their clients as to the best and most economical way of consuming the largest quantity. It is, I submit, quite clear that we have arrived as regards our gas supply and consumption, at a position the most favourable for all parties concerned. The companies are firmly established; and their aggregate capital is enormous. The industry has eventuated in being a very lucrative investment for those who started it. All the engineering and commercial conditions of supply and demand are thoroughly well understood; and most of the advantages, disadvantages, and precautions inherent to the use of gas as an illuminant are matters of every-day common sense amongst, at any rate, the educated classes."

Turning to electricity, Major-General Webber referred to it as a rival, "which science teaches us must eventually supersede all other means of conveying energy, whether for lighting or for power." Confining himself to the sanitary aspect of the question, he thought that they might fairly admit that the rivalry of electricity with gas as an illuminant is one of a very important character in the interests of health; and it is past controversy that the most important advantages to health and length of life will accrue to the population which lives and works under its illumination during the hours that sunlight is not available. Moreover it may fairly be inferred that the growth and development of the rising generation of the country will be benefited by the universal adoption of this means in quite as great a proportion as it is now deteriorated by the more or less improper use of gas. The address proceeded: "One thing is certain, and that is, if half what I attempt to describe is borne out by facts, nothing will prevent the gradual introduction and universal adoption of electricity as a means of lighting; so that gas undertakers will be wise to accept the inevitable, and even take up the position of public benefactors, and, in their own clear interests, join on to their present business that of the manufacture and supply of electricity. They have besides, however, a great development and their present industry at their feet, the profits of which to them will far exceed anything they have made by lighting gas. I mean by the distribution of cheap heating gas, the use of which alone is the key to the solution of the great question of smoke abatement . . . . Hitherto it has been the habit of many to reiterate that electricity is still in its infancy, and not well enough understood for commercial distribution. It is true we cannot touch, or smell, or see it; and perhaps that has something to do with its rejection. I was startled the other day to receive a letter from a friend in South Africa—a contemporary in the study of electricity—in which he informed me that he had just formed a Company for lighting by gas the town of Johannesburg in the Transvaal. He alluded to a former suggestion of mine, that in a new country like this, electricity was, as a matter of course, the proper illuminating agent, as a visionary and speculative proposal, only to be realized in years to come. He took no account that the transport of the electrical plant from home to do the same work must cost half that of the gas plant, or of the advantage of starting electric light without competition in a country where the question of heat from lamps was of much importance. Now, Johannesburg is a town that has sprung into existence, including its 20,000 inhabitants, in two or three years; and they expect to charge 10s. per 1000 feet for gas. They could make a good profit out of electric lighting, if they charged half that rate, light for light. Is it true that my friend is right, and the electric lighting is still in its infancy? I think not, and that Johannesburg will suffer for the procedure of its local authorities. I am told that the Boer Government will grant a concession of 50 years for gas lighting, but none for electric lighting." General Webber then called attention to the number of Electric Lighting Provisional Orders and Licences that have been applied for, and to the large amount of information on the subject of electric lighting now in possession of electrical engineers; and, in conclusion, he pointed out the differences between the systems now under the consideration of the Government, which he classed under two heads—(1) The system which employs alternating electric currents, and supplies the energy direct from off the machinery in motion; (2) the system which uses continuous currents, and accumulates or stores the electricity as essential to the process of supply, so hat the co nsumer is independent of the machinery in motion.

At the conclusion of the address, a vote of thanks was passed to Major-General Webber, on the motion of Professor Ayrton, seconded by Professor Hughes.

Melbourne Exhibition Award.—Messrs. John Wright and Co. have secured a First Award, with special mention, for their gas-stoves at the Melbourne Exhibition.

Australasian Gas Association, Limited.—This Company was formed early last year with a capital of £250,000, in shares of £10 each (60 of which are founders' shares), for the purpose of acquiring existing, and the erection of new gas-works, or adopting other means for public and private lighting and heating in the Australasian colonies. The first issue of 3000 shares having been allotted, the Company are now offering the balance of the second issue of 5000 shares of £10 each. An interim dividend at the rate of 6 per cent. per annum was paid last month, as the result of the first half-year's work. The Company have already acquired four Australian gas-works—viz., Benalla, Shepparton, Wangaratta, and Warragul—all in Victoria; as well as an interest in the Charters Towers (Queensland) Gas Company. These form a good nucleus of the undertaking, which is working under the chairmanship of Mr. H. L. Hammack, one of the Directors of the Commercial Gas Company, with Mr. J. Coates, M. Inst. C.E., as Managing Director and Engineer.

Gas Companies as Electric Light Suppliers.—In the Journal for the 30th ult., we quoted, from the *Electrical Review*, several cases in which gas companies have undertaken the supply of the electric light. We now give, from the same source, a few other instances. The Gas Lighting and Heating Company, Limited, of Corogne and Vigo (Spain), after having lowered its tariff to compete with the electric light, has now made proposals to the Municipality for supplying the electric light itself. The same course was adopted some time ago at Toulon, where the Gas Company has received powers to erect a central station on a small scale. At Montpellier, the opposition of the Popp Electric Light Company in the second half of the past year caused a diminution of £4500 in the receipts of the local Gas Company. The latter has in consequence established a small central station (power being supplied by gas-engines), which feeds 230 lamps. This has arrested the progress of the Popp Company, which at present lights the town theatre, and, in addition, supplies 350 lamps.

THE MANUFACTURE OF PARAFFIN OIL IN SCOTLAND.

At a recent Meeting of the Glasgow and Scottish Section of the Society of Chemical Industry, a paper was read by Mr. D. R. Steuart, F.I.C., F.C.S., comprising a short sketch of the whole paraffin oil manufacture as carried on at Broxburn. A brief abstract of the paper appeared in our issue for the 26th ult.; and the following additional particulars are taken from the last number of the Society's *Journal*.

The author exhibited samples of the bituminous shale which forms the staple material, and of the products—including sulphate of ammonia, naphthas, burning oils, lubricating oils, solid paraffins, gas oils, and still coke. The naphthas were ·730 and ·740 sp. gr., and are used as solvents for burning in special lamps, and for refining paraffin. The burning oils were ·800 to ·840 sp. gr.; and the lubricating oils ·865 to ·895 sp. gr. The soft paraffin, melting at 100° Fahr., is used for dipping the sticks of matches, and for hand lamps; and paraffin wax, semi-refined and refined, with a melting-point of 118° to 130° Fahr., is used for candle making. Solid paraffin and paraffin oil are also much employed for the washing of clothes.

The Boghead or Torbanehill mineral, which yielded 120 gallons of crude oil per ton, was exhausted in 1862; and the shale at present worked is known as the Broxburn seam. It averages upwards of 5 feet in thickness; part giving upwards of 40 gallons per ton, and the remainder little more than 20 gallons. The shale is raised in the immediate vicinity of the works, brought by wire-rope railways to the breaking machines, where it is reduced to pieces the size of one's fist, and conveyed in a similar manner to the tops of the retorts. It contains by analysis 20 per cent. of carbon, 3 per cent. of hydrogen, 0·7 per cent. of nitrogen, and 1·5 per cent. of sulphur; and nothing can be dissolved out of it by treating with shale naphtha or ether. The solvents remain clear and colourless; proving that the products do not exist in the shale as such, but are created by destructive distillation. About 1000 tons are treated per day; and the yield is 12 per cent. of crude oil, 8 per cent. of ammonia water, and 4 per cent. of crude gas; the spent shale containing 9 per cent. of combustible matter, and 67 per cent. of ash. The yield per ton of shale is 30 gallons of crude oil, 65 gallons of ammonia water, and nearly 2000 cubic feet of gas. A red heat, invisible in daylight, and faintly visible in the dark, gives the best quality of crude oil, as a higher temperature produces a heavier, darker product; causing more loss in refining, and yielding less solid paraffin, but more ammonia.

The only form of retort used at Broxburn is Henderson's patent, of which there are 784, arranged in 16 benches, on the works. It is vertical, 15 feet long and 2½ feet by 1½ feet in section; and receives a charge of 18 cwt., which is allowed to remain in it for 16 hours. The spent shale is dropped into the furnace; and some of the permanent gas is also burnt as fuel. Superheated steam, at a temperature of 630° Fahr., is introduced into the top of the retort. It is a means of introducing the right temperature through the mass of the shale, and also of sweeping the products out of the retort, where they would undergo decomposition. The products pass off from the bottom of the retort to a condenser consisting of plain vertical iron pipes. The liquids are separated by gravity into crude oil and water in a separating-tank, and pass to their respective store-tanks. The non-condensable gases pass through large scrubbers to remove the ammonia; and some naphtha is also separated. The temperature of the shale in the retort is from 630° to 730° Fahr., and that of the products at the exit-pipe 500° to 600° Fahr. Solid reagents—such as lime or soda—have been tried in the retort, with the view of increasing the yield of ammonia and getting a purer oil, but with little success. Gas reagents are more promising, steam is always used, and hydrogen, ammonia, and air have also been applied with some advantage.

Of the 1·5 per cent. of sulphur, more than 1·4 per cent. remains with the spent shale; and the rest is pretty equally divided between the gas, crude oil, and ammonia water, so the crude oil contains less than 0·3 per cent. The nitrogen is equal to 70 to 90 lbs. of sulphate per ton; but no more than one-fourth is secured in this form, and nearly one-half remains in the spent shale. During the progress of a charge, the distillate gradually increases in specific gravity from ·863 to ·888, and in the setting-point from 78° to 87° Fahr. The loss with oil of vitriol gradually rises from 5½ per cent. at the beginning to 10 per cent. about the middle, and then back to 5½ per cent. The loss with soda gradually rises from 2·6 to 3·8 per cent. The yield of oil at the end of the charge is comparatively small for some hours. The permanent gas not only lights the works and fires the retorts, but a considerable quantity remains to assist in raising steam.

The crude oil is dark green, semi-solid at ordinary temperatures, quite fluid if gently warmed, but setting at about 80° on account of the solid paraffin in it. The average specific gravity is ·865; but at some other works it is ·880 or ·890. The author's own shale, when distilled in the gas-works at a red heat, gives about 4500 cubic feet of rich gas, 9 gallons of crude oil of ·952 sp. gr. (which is a thin liquid, and contains little or no solid paraffin), and only 8½ lbs. of sulphate of ammonia per ton. The low yield of ammonia shows the influence of the high temperature in the absence of steam. The ammonia water averages 2½° Twaddel, and contains ammonia equal to 0·277 lb. of sulphate per gallon, chiefly in the form of carbonate. There is a small proportion of sulphur as sulphide, traces of other sulpho-compounds, but no cyanide or sulpho-cyanate; and the proportion of fixed ammonia is so small that lime is not used in distilling. The still used is a column 22 feet high and 5 feet in diameter, containing a series of trays, with baffle-plates, &c., that cause steam to bubble through the liquor on each tray. Steam at from 25 to 30 lbs. pressure is admitted through a 2-inch pipe at the bottom, and the liquor is run in at the top. This still will effectually deal with 35,000 gallons of liquor per day, and is found very economical in working and in first cost. The ammonia is received in saturators charged with weak sulphuric acid that has been used for refining the oils. A black tar separates from it, and rises to the surface, and the clear liquid is run off and evaporated by steam coals. Sulphate so made is of a grey colour; but a white salt could be obtained, if desired, by employing a pure acid.

Having described, by the aid of drawings, the system of distillation (which is a continuous one), the author remarked that all the products belong to two series of hydrocarbons—olefines and paraffins. Both these are represented in the permanent gas, naphtha, and burning oils; but in the higher members of the series, the paraffins appear as solid paraffin and the olefines as viscous liquids. The impurities are tarry compounds that yield olefines and a little paraffin on distilling, contain a proportion of strong bases belonging to the leucoline and picoline series, and a proportion ready to unite either with sulphuric acid or soda, and reckoned as partly belonging to the phenol group. Water on being converted into steam increases in bulk 1700 times, burning oil less than 200 times, and heavy oil less than 100 times; so the steam blown into the stills is useful in mechanically carrying over the vapours into the condensers. Oil distilling into an atmosphere of steam boils at a much lower temperature than when distilling into its own vapours.

The manufacture of paraffin oil is carried on in Scotland by 14 companies; and the annual production is something like 60 million gallons of crude oil from 2 million gallons of shale—the value of the refined products being about £1,500,000 sterling. The capital invested is £2,000,000; and the works employ 10,000 men.

The introduction of the electric light into Geneva led the Geneva Gas Company to take proceedings against the Municipality for what they regarded as an interference with the supposed monopoly of the lighting possessed by them under their concession. The case was decided against the Company; and the decision has been confirmed on appeal.

There has just been fixed as the Holmfirth Gas-Works, by Messrs. R. Dempster and Sons, Limited, of Elland, a rotary exhauster capable of passing 20,000 cubic feet of gas per hour; and the firm have a similar one in hand for Mossley, as well as several others of various sizes. They have lately completed, at the works of Colonel Platt, at Llanfairfechan, North Wales, some plant which includes a small rotary exhauster driven by a hydraulic motor. Orders for purifiers (26 ft. by 16 ft.) for Hartlepool, and for the whole of the retort-fittings for the Salford Gas-Works, have also been placed with them.

According to *Industries*, an important lawsuit for infringement of patent rights is now before the Nivelles Tribunal. It has reference to a joint for gas and water pipes invented and patented by M. Somzée. The patents date from 1868, 1877, and 1878; and the claim, broadly stated, covers the employment of an elastic packing-ring, forced into the joint under great pressure. The ring, generally of india-rubber, is laid over a curve in the front of the male part, which is slightly conical for a short distance, and then parallel; the latter part having, however, serrations to prevent the india-rubber slipping when the male part is forced into the female part, which is only very slightly larger, thus causing the ring to become thinner and broader as the pipes are forced together. M. Somzée states that this patent has been infringed by certain persons who, he alleges, are making or using such joints; and the municipal authorities of Brussels are joint defendants, for having used these joints. The damages are laid at £20,000. The lawsuit is one of old standing, having first begun in 1881; but it has been allowed to drop until the present time.

Under the auspices of the Liverpool Engineering Society, Mr. C. H. Belce, M. Inst. C.E., recently read a paper on "The Purification of Water and Sewage by the Magnetic Spongy Carbon Process." Mr. Belce stated that the difficulties attending the use of all previously known filtering media had led to the discovery of a material known in commerce as "polarite." This mineral had been carefully examined and tested by Sir H. Roscoe, M.P., who had reported that its complete insolubility and freedom from rust constitute its claim to be considered a valuable filtering material. It extracts iron and lead from water, and destroys organic matter in solution. There were, he said, several methods of applying this material to the purification of water. Water could be purified on a large scale by passing it through a filter constructed in a manner similar to the ordinary sand filters, with the addition of a layer of "polarite" at least 6 inches thick, mixed with an equal quantity of sand. From 500 to 1000 gallons per square yard could be obtained from it in 24 hours; this being a higher rate than by the ordinary filter. Proceeding to the filtration of sewage, the author described the "international process," which is in use in various places. It comprises a magnetic precipitant and deodorant called "ferozone," which is rich in ferrous iron, and which also contains alum, calcium, sulphate of magnesia, and rustless magnetic oxide of iron in a very spongy and absorbent condition. Its cost for filtering sewage would be about 14s. per square yard, or £4 per ton.

Correspondence.

[*We are not responsible for the opinions expressed by Correspondents.*]

WATER GAS.

SIR,—A new malady appears to have suddenly developed itself to a large extent of late. About 10 years ago, "electromania" was at its worst. Now, instead of hydrophobia, it appears to be "hydromania" that has broken out; for truly the public seem to have run mad after water gas—rushing to offer £450,000 for the right of using in Scotland and three counties of England patents, some of which have almost expired, while considerable doubt has been thrown on the value of others. It is quite clear that neither water gas nor incandescent gas-burners are new things; but the public—ignorant that they are over half-a-century old—hail them with acclamation, as if some new suns had risen over the horizon.

An example of the ignorance or the audacity of inventors is alluded to in the last number of your JOURNAL, in reference to the "Loomis" gas. It is stated by *Light, Heat, and Power*, that 2000 lbs. of bituminous coal gives 130,000 cubic feet of gas; each cubic foot giving 350 British thermal units. This is 146,000 cubic feet per ton. Now, although the heat units are more than half those of ordinary coal gas, we will allow 40 cubic feet per indicated horse power, instead of 20 as required by a good gas-engine with 16-candle gas; and we have the marvellous result that we will for one ton of coal get 3650 indicated horse power, or 1-horse power for 10 hours every day in the year, without even excepting Sundays. This seemed rather startling; so I applied the following very simple test to the statement.

To obtain 130,000 cubic feet from 2000 lbs. of coal is equal to 65 cubic feet per pound. If we multiply this by the alleged 350 thermal units per cubic foot, we get 22,750 units per pound. The best determinations give only about 14,000 units as the total heat that can be produced by the complete combustion of 1 lb. of good bituminous coal. Whence then have come these additional 8750 units? I have heard of many patents which proposed impossibilities, but few of them which "flew in the face" of natural laws more directly than this. It must be remembered that in all gas producers, a large amount of heat is employed dissociating and making volatile the solid fuel; a large amount is lost by radiation and conduction; and a large amount in heating and expanding the air and gases. All this heat is completely lost in the condensers and purifiers. In fact, the producer gas issues at a high temperature, the whole of which is uselessly dissipated.

Mr. Alfred Wilson, the Engineer to the British Water-Gas Syndicate, may be very sanguine about the inventions of himself and others; but he is a scientific engineer of character and ability, and would be incapable of conceiving or talking such nonsense as the Loomis people. For instance, his estimate for producer gas is only 67 feet; each foot giving 140 units, or 9380 units per pound of coal; while for water gas, he estimates under 16 cubic feet, each giving 293 units, or under 4600 units per pound of coke. Producer gas is thus said to give less than two-thirds, and water gas less than one-third, of the heat produced by the complete combustion of the fuel used. In fact the benefits to be secured by either system arise, in the first case, by enabling us to use a very inferior class of fuel; and in both cases in turning a greater or less portion of the fuel into gases which are convenient to use, and are also easily regulated and distributed. It is admitted that by their use a large portion of the inherent efficiency of the coal is wasted. Admitting Mr. Wilson's figures to be correct, 50 cubic feet of water gas per hour would be required for a gas-engine; and this means $\frac{35{,}000}{50} = 700$ hours, instead of the 3650 claimed by Loomis.

No vein of precious gold was ever as valuable as the ignorance of the public, when skilful prospectors (or rather *prospectusors*) sink their shafts into its utterly unfathomable depths.

DENNY LANE.

Cork, May 10, 1889.

SIR,—In my first communication (*ante*, p. 668), I explained, by an original form of thermic estimation relating to the values of producer and water gas, that the absence of nitrogen in the latter is not always an advantage. Your correspondent "Gas," who makes a necessary correction of a clerical error in my equations, shows that, for a lower final temperature of the products of combustion of producer gas, the balance of possible useful effect is in favour of producer gas. For lower temperatures, down to a limit of 100°C., the result will be increasingly in favour of producer gas, because the latent heat of steam represents a fixed loss, not depending on the final temperature of the products of combustion; whereas the lower the temperature of the products of combustion of producer gas, the less the unavoidable loss of heat. If the products of combustion of water gas could be passed through water, or otherwise condensed, and the latent heat of the water vapour recovered, the theoretic loss would be—

$$\frac{16{,}847 \times 100}{125{,}208} = 13{\cdot}4 \text{ per cent.};$$

representing an advantage of 6·7 per cent. in favour of water gas. But for nearly all practical purposes, such a condensation would be inconvenient.

I have shown that to effect a given calorific result in the instance of the fusion of pig iron and steel scrap for the production of the low carbide of iron known as steel, some 7,392,000 British units are absorbed when water gas is used; but, with producer gas, 14,400,000 British units are required. As this correspondence refers merely to the thermic economy, and does not touch that of finance, I think the comparison demonstrates the advantages of the higher thermic value per unit of volume possessed by water gas in a most striking manner; and I could show that such a result might theoretically be anticipated. Such a high thermic efficiency and economy means an accelerated production; and every manufacturer knows that if the output efficiency of a furnace, or indeed any agency of industry, is doubled, the cost of direct supervision is not increased in the same ratio, whilst the cost of official administration remains the same, so that the cost of production is considerably reduced. If this correspondence dealt with the financial question, all the items of saving would have to be taken into account to enable a fair estimate to be realized.

The prior and incomplete former correspondence referred to by "Gas," I consider useless and misleading. If the thermic result of using water gas is in its favour, but the relative financial cost (a variable figure) is against its use, it is only fair to credit the water gas with the *pari passu* advantages derivable from its use; and I hope before long to be able to give the financial value of the application of water gas in precise figures from my own practical experience.

The relative value of the gas generated in the improved apparatus referred to by "Gas," does not bear on the question at all. It simply shows that, in one instance, the producer gas carried with it an initial thermic loss of 11,000,000 British units of heat, and in the other case of 5,000,000 units lost in the reactions involved in generating the gas, and by radiation and convection. Why does your correspondent constantly refer to producer gas by a specific name? Why not call the producer gas Bischof gas, as on this name rests the fame of the invention of the gas generator, and not on that of any member of the deservedly eminent Siemens family? I could, in imitation of "Gas," expatiate upon the gas producer bearing my own name; but this would be advertising, and would detract from the value of a correspondence that has for its simple aim the estimation of the possible relative thermic efficiencies of producer and water gas.

So far, the correspondence shows that, owing to the high thermic value of water gas, a thermic saving, in one specific application, of 50 per cent. is obtainable by its use; but the net financial value can only be estimated by a comprehensive estimate. The correspondence also demonstrates that the advantage of the absence of nitrogen in water gas is more than counterbalanced by the absorption of the thermal units by the water.

The real value of water gas is found in its high thermic character per unit volume. In any given volumes of producer and water gas, the ratio of thermal units is as 60·8 : 277 in favour of water gas.

B. H. THWAITE.

Liverpool, April 29, 1889.

[In view of the letter below, it should be mentioned that Mr. Thwaite's letter (which appeared in *Industries* on the 4th inst.) did not reach us in time to be given last week.—ED. J. G. L.]

SIR,—In Mr. Thwaite's letter the following statement is made:—"For the production of the low carbide of iron known as steel, some 7,392,000 British units are absorbed when water gas is used; but with producer gas 14,400,000 British units are required." This statement, of course, was made by mistake, for both water gas and producer gas are only vehicles by means of which coal is utilized in the gaseous form; and the same number of thermal units are required to produce a given effect, whatever gas may be used.

As regards the theoretical aspect of the question, I have shown, and Mr. Thwaite agrees with me, that with chimney temperature of 370° C. there is a saving of 2 per cent. in favour of producer gas as compared with water gas. I have had no experience with water gas; but, from the reports which have appeared in the public prints, I have culled a few facts, and from these I have shown that for melting steel on the open-hearth, producer gas is from 74 to 100 per cent. cheaper than water gas. Mr. Thwaite seems to consider the commercial aspect of the question not to be of any importance; but I submit that manufacturers and iron-masters will consider it just the most important point. Hence I cannot agree with him that a reference to Mr. F. Siemens's letter, written in the autumn of last year, was either useless or misleading. That letter was never answered; and the facts and conclusions it contains remain unchallenged to this day.

I agree with Mr. Thwaite as to the advantage of quicker work causing a reduction in charges for supervision, administration, &c. The use of water gas, owing to its higher initial temperature of combustion, would reduce those charges; but, as Mr. Thwaite says, all the items of expense must be taken into account. The effect of such higher temperature on the walls of furnaces would be to increase considerably their wear and tear—in what ratio I will not at present say; but judging from the well-known life of a regenerative gas steel-melting furnace as compared to a regenerative gas heating furnace, that ratio would probably not be less than the square of the temperatures at which they are respectively worked. But can we get suitable materials to build these high-temperature furnaces. Silica bricks can only just stand the temperature of steel melting carried on with producer gas; and will not the cost of, and stoppages for repairs increase considerably if higher temperatures are employed? Information which can only be gained by experience is required on these points; but on another point, which also affects the commercial aspect of the question, we have full information. Water gas has been produced at 4d. per 1000 cubic feet; and 35,000 cubic feet of water gas are produced per ton of coke. Therefore it is clear that the coke can be purchased under (35 × 4d.) 11s. 8d. per ton, as there is some expense attending the manufacture of water gas. But if the manufacture of water gas is to become an industry in this country, will lighting gas companies be satisfied to receive for their coke 11s. 8d. per ton, less the cost of manufacture of water gas, for which nothing is allowed in this figure? For it must be remembered that coke is not a natural product, but must be made; and its price may be expected to rise, owing to its increased use, and its diminished production at gas-works should water gas find favour as an illuminant.

With reference to "Bischof" gas, I have been at some pains to find in the text-books a reference to Bischof as an inventor of gas producers. I have not succeeded in tracing him in Percy. In the new edition of Phillip's "Metallurgy," it is stated (p.97) that experiments were made in the Harz (1839) by Bischof, with the view of generating gases in a furnace or producer, and subsequently burning them by means of atmospheric air; but I have failed to find that the Bischof producer has had any practical application. It was worked by the chimney draught of the furnace with which it was connected—that is to say, by suction (a method not recommended, I believe, by Mr. Thwaite); and hence leakage of air into the producers and flues must have occurred, and the gas must have been so deteriorated as to have been rendered absolutely useless for metallurgical purposes before it reached the furnace. The Siemens producer, on the other hand, is a well known apparatus, of which thousands are in use in this country and abroad. It is worked with internal pressure, which is essential for attaining

practical results; and it was quite natural that it should have been referred to by name, as the waste product from the water-gas converter was, in the correspondence, referred to as producer gas.

London, May 7, 1889. GAS.

ON FLAME.

SIR,—Mr. F. J. Rowan, of Glasgow, is to be thanked for bringing forward the subject of the nature of flame; and you are to be congratulated on the publication of his paper and some discussion and criticism thereon. There is in this subject a grand field for scientific inquiry, which should be highly in accord with the studies and practice of gas engineers, and which might well receive a degree of investigation at the hands of the more practical, as well as from the more theoretical, members of the profession.

When I introduced the subject to the attention of the gas world in 1885, in connection with some investigations of my own, I fear the interest in the nature of combustion and flame was not such as would have warranted, at that time, further publication of studies in the same direction. It is certain, however, that there has been great progress of thought during the last few years; and it was with pleasure that I read in your columns the expression of doubt in the incandescent free-carbon theory. That this theory does not account for all, or nearly all, the observed facts of luminous flame, I have for many years been sure of; and thus I have been unable to accept Mr. Siemens's view of such form of combustion.

I am also more than ever convinced that the demonstration of the true theory will be by means of experiments conducted with a view to first ascertain, without doubt, what is the effect of air at different temperatures on the operation of combustion *per se*. I do not know whether to be most glad, or otherwise, at the fact that Mr. Foulis appears to take the opposite view to Mr. Rowan; as if he will only devote himself to experiments on the subject, he is sure to render service of value, in getting at the truth of this matter, whichever side he takes at present—for we all have to go to one side when the truth thereof is properly demonstrated.

I would like to point out that in your report of the remarks made by Mr. Foulis, he appears to attribute two opposite results to the introduction of hot air for combustion, under presumably differing conditions. On page 856, first column, commencing line 16, and ending line 21, it is stated that the supply of hot air *shortens* the flame in the best regenerative lamps; whereas in the second column, the apparently contrary statement is put into the mouth of Mr. Foulis, where he says that in a retort setting (referred to) the flame was *lengthened* "not by introducing colder air, but by introducing *hot* air."

Now I do not refer to this to cavil at either statement, but to suggest that if Mr. Foulis finds *both* these facts to be true, an explanation which will reconcile them is needed; and, if the free-carbon theory is true, he must agree therewith. On the other hand, if there is anything incorrect or incomplete in the report, he will do a service to students of this subject to correct the same.

I am quite disposed to accept the theory of flame, or a modification thereof, suggested by Dr. Frankland, and named by Mr. Rowan; but I am inclined at present to believe that it is only *between* certain temperatures (not yet defined) where combustion is a visible or luminous phenomenon.

As for the experiments of Soret and Burch, interesting and clever as they were, Mr. Rowan is quite right in concluding that they do not dispose of the question at all, and that the problem must be attacked from a different point of view.

Manchester, May 10, 1889. WILLIAM GADD, C.E., F.R.M.S.

WATER BY MEASURE.

SIR,—"Positive" has certainly contributed some very valuable information as to the impracticability or the non-advisability of changing the method of supply to that of measurement advocated by "Low Pressure." No one has adversely criticized the capabilities of the low-pressure meter; this not being a factor in the argument. What I wish to learn is what advantages are to be derived by changing the present system of supply to the new system of supply by measure.

I am sorry that "Low Pressure" is not inclined to advance facts or figures, nor willing to state an imaginary case, showing the favourable result as regards cost and greater satisfaction to the consumer. Of course, a minimum rate must be charged, as stated by you (p. 848); but one rate will not do for every company and every district. Each must be advised on its own merits, considering the difficulties each company has to contend with in obtaining and distributing its supply.

I may be told to observe the "courtesies of controversy;" but really I think "Low Pressure" owes your readers fuller information than he has already sent on this important subject. If he still objects to be "drawn," perhaps "Positive" will supply the concluding link to the controversy—viz., the cost of altering the present system.

May 10, 1889. NEW STUDENT.

OIL *v.* GAS AT SHANKLIN (I.W.).—According to a local paper, about half the tradesmen at Shanklin have discarded gas and adopted oil for the lighting of their premises; and this illuminant has been adopted in the reading-room at the Institute. The subject is exciting much interest in the town, as it is proposed to introduce oil into the churches.

THE INSPECTION OF GAS-METERS AT MANCHESTER.—At a special meeting of Justices held last Tuesday at the Manchester City Police Court, the Official Inspector of gas-meters submitted a report for the year ending March31 last. During the year the Inspector tested 8515 meters—viz., 7260 wet, and 1255 dry meters. The fees charged amounted to £281 18s. Compared with the preceding year, this showed a decrease of 37 meters, and £18 13s. in fees. The excess of expenditure over receipts was £374 14s.; being £17 19s. less than the adverse balance the previous year. The percentage of rejected meters on the gross number tested—viz., 8515—was 5·84, chiefly old meters; in the previous year, it was 5·87. Of wet meters rejected, the percentage was 2·31; and the mean percentage of error was shown to be five fast and seven slow. Dry meters showed a percentage of 26·29—the mean percentage of error being six fast and fourteen slow. The legal percentage of error on both wet and dry meters was two fast and three slow. Beyond these limits the Government stamp was not affixed. The total number of meters tested since the opening of the office in 1882 was 248,529. The fees amounted to £15,106 17s.

Parliamentary Intelligence.

HOUSE OF LORDS.

THURSDAY, MAY 9.

The Belfast Water Bill and the Bury Corporation Bill were referred to a Select Committee, consisting of Lord Belper (Chairman), the Earl of Buckinghamshire, Earl Harewood, Lord Lawrence, and Lord de Vesci; to meet on Thursday, May 16.

GAS AND WATER PROVISIONAL ORDERS.

A Bill to confirm certain Provisional Orders made by the Board of Trade, under the Gas and Water Works Facilities Act, 1870, relating to Buckley Gas, Market Rasen Gas, Melton Mowbray Gas, Romford Gas, and Warminster Gas, and a Bill to confirm other Orders made by the Board in reference to Brightlingsea Water, Corsham Water, Faversham Water, Harpenden Water, and Llandrindod Wells Water, were brought in by Lord Balfour, read the first time, and referred to the Examiners.

The following progress was made with Private Bills during the past week:—

Further Standing Order complied with: Faversham Gas Bill, Great Wigston Gas Bill, Kettering Water Bill.

Bills read a second time and committed: Edinburgh and District Water Bill, Faversham Gas Bill, Heywood Corporation Bill, Kettering Water Bill, Morley Gas Bill, West Ham Gas Bill.

Bills reported: Cleveland Water Bill, Eastbourne Water Bill, London Hydraulic Power Company Bill.

Bills read the third time, and passed: London Hydraulic Power Company Bill, Manchester Corporation Bill.

HOUSE OF COMMONS.

The following progress was made with Private Bills during the past week:—

Further Standing Orders complied with: Burnley Corporation Bill, Tuscan Gas Bill, Windermere District Gas and Water Bill.

Bill read the first time: Manchester Corporation Bill.

Bills reported: Bristol Water Bill, Yeadon Water Bill.

Bills read a second time and committed: Belgrano (Buenos Ayres) Gas Company Bill, Coventry Corporation Water Bill, Garw Water Bill, Plymouth Dock (Devonport) Water Bill, Wakefield Corporation Water Bill.

Bill withdrawn: Rickmansworth and Uxbridge Valley Water Bill.

Petition presented: Padiham and Hapton Local Board, against the Burnley Corporation Bill.

Petitions withdrawn: Halifax Corporation, against the Deanhead Commissioners' Bill; South-West Suburban Water Company, against the Rickmansworth and Uxbridge Valley Water Bill.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

SATURDAY, MAY 11.

(*Before Mr. Justice* NORTH.)

In re THE LUCIGEN LIGHT COMPANY, LIMITED.

Mr. MILLAR said this was a petition presented under the Act of 1867 for the reduction of capital. The Company was formed in 1887 to adopt and carry into effect an agreement for the acquisition of certain patent rights and privileges, and to acquire any additional patents relating to similar inventions. The capital was £250,000, divided into 50,000 shares of £5 each. Special resolutions were passed on the 4th and 24th of February to reduce the capital to £50,000, divided into £1 shares; such reduction to be effected by cancelling £4 on each share. When the patents were purchased, they were believed to be of great value; but the Company had since ascertained they were superseded by improved apparatus. The grave defects in the patent lamp arose principally from the spray of oil thrown off in working. An improved lamp had been brought out remedying this defect; and having regard to the fact that their patents had become almost worthless, the Company had purchased the rights in the new lamps. It was proposed to carry on the Company with the reduced capital; but as £20,000 had been lost, or was unrepresented by available assets, it was thought necessary to have the sanction of the Court to the reduction.

Justice NORTH made the order for reducing the capital, and directed that the Company should use in their title for one month the words "and reduced."

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

MONDAY, MAY 6.

(*Before Justices* MATHEW *and* GRANTHAM.)

STRUBE *v.* SOUTHWARK AND VAUXHALL WATER COMPANY.

This case came before the Divisional Court by way of appeal from Mr. Justice Hawkins, who at the trial of the action, which was reported in the JOURNAL for Dec. 11 last (p. 1029), directed a nonsuit. The plaintiff sued for damages, in consequence of having fallen down and broken his leg, owing to putting his walking-stick into a hole in the pavement in a street in Walworth; the hole proving to be an iron box containing a screwdown stopcock on the service-pipe from the defendants' main to the house of a consumer. It was agreed at the trial that if the Court should be of opinion that the defendants were liable, the damages should be £40.

Mr. COCK, Q.C., and Mr. FILLAN appeared for the appellant; Mr. FINLAY, Q.C., and Mr. M'CALL for the defendants.

Mr. FILLAN argued the case for the appellant, and said the point relied upon by the defendants was that they were not liable, because the stopcock was the property of the consumer; but he submitted that as the stopcock and box were supplied by the Company, and were supervised by them (and in this case it was admitted that, though the consumer was charged 5*s.* for the apparatus, the charge had not been enforced), the Company were liable.

Mr. M'CALL, on behalf of the respondents, urged that there was no liability on the Company; and he cited cases in which it had been held that damage occasioned by a defect in the communication-pipe did not impose any liability on a Water Company.

Mr. COCK, in reply, submitted that the defendant Company in fact supplied the box for their own purposes. The very box bore upon it the words "Southwark and Vauxhall Water Company." They supplied it, and never asked for payment for it.

Justice MATHEW, in giving judgment, said the only question was whether there was any evidence on which the jury could reasonably arrive at the conclusion that the defendants were liable. The article in question was supplied by the defendants, to be used in the pavement in front of the consumer's house. It was put there with the intention that from time to

time, whenever necessary during the occupancy of the consumer, it might be used by the defendants. It was placed in a public thoroughfare, and was unquestionably dangerous to those using the thoroughfare. There was evidence, therefore, that it was a nuisance. The case was withdrawn from the jury on the understanding that if there was evidence of this description, judgment should be entered for the plaintiff for £40. It seemed to him that there was such evidence; and judgment must be entered accordingly.

Justice GRANTHAM concurred.

On the application of Mr. Finlay, judgment was stayed with a view to a further appeal if notice were given in a week.

FRIDAY, MAY 10.

(*Before Mr. Justice* CHARLES.)

MOYES *v.* RITCHIE AND JEFFERDS.—THE ARCHER GAS COMPANY.

In this case the plaintiff, an oil expert, living in Glasgow, sought to recover from the defendants, who reside in London, the sum of £2000, partly in cash and partly in shares of the Gas Patents Syndicate Company, Limited, under certain contracts. The defendants in 1885 contemplated the formation of a Company to work in England a patent taken out in America by a Captain Archer for the production of gas from oil (see *ante*, p. 852); and they agreed to pay the plaintiff the sums sued for, on condition of his transferring to them his interest in a contract for the supply of 500,000 gallons of oil, and assisting in the promotion of the Company. After experiments had been satisfactorily made with the oil by means of the invention, the Archer Gas Company was formed, but ultimately collapsed. In 1888 the Gas Patents Syndicate Company was successfully promoted, and the defendant Ritchie sold Archer's patent to it for a considerable sum. Ritchie now pleaded that the contracts with the plaintiff had reference only to the Archer Company, and that he was therefore not liable. Jefferds submitted that as a contract he had made with Ritchie with reference to the Company had not been carried out by Ritchie, the plaintiff could not recover from him; and early in the hearing of the case, his Lordship agreed with this view.

Justice CHARLES, in giving his decision as against Ritchie, held that in law the contracts referred only to the Archer Company, and his judgment was therefore for Ritchie. He, however, regretted that it was such, because Moyes had undoubtedly rendered the services that were required of him by the contract; and as Ritchie had pleaded that the plaintiff had not completed his part of the contract, judgment would be without costs.

HIGH COURT OF JUSTICE, IRELAND—EXCHEQUER DIVISION.

THURSDAY, MAY 9.

(*Before Chief Baron* PALLES *and Mr. Justice* ANDREWS.)

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY *v.* THE CORPORATION OF DUBLIN.—THE PUBLIC LIGHTING QUESTION.

To-day the action brought by the Alliance Gas Company against the Corporation of Dublin in regard to the charge for gas supplied to the public lighting (*ante*, p. 767) was again before the Court, on the motion of the Corporation to have the matters in dispute referred to arbitration.

Mr. WALKER, Q.C. (with whom was Mr. R. ADAMS), said the defendants had furnished to the Court the heads of the counter-claim against the Company, as suggested. They included claims as regards the quality of the gas and the quantity of gas supplied; and also set forth that the lamps were not kept in proper repair, that the plant the Company were bound to supply was not supplied, that proper facilities were not provided for the testing of the gas, that the testing-station was placed on an improper site, and that the allowance made by the Company, by way of discount to large consumers, was not granted to the Corporation.

The CHIEF BARON said there were several of these matters which could not be referred to arbitration; but he thought the Court could refer the questions as to the quantity and quality of the gas, and the non-supply of proper burners and governors.

Mr. MARTIN, Q.C. (with whom was THE M'DERMOT, Q.C., and Mr. A. HOLMES), on behalf of the Company, said that the terms of reference suggested by the Corporation were of the vaguest character. So far from the Corporation having any cause of complaint, the Company did not charge them for the gas supplied the full amount which under the statute they might demand. The claims now put forward on the part of the Corporation were different from those made in the correspondence with the Company. As to the question of the quantity of gas supplied, the Company had no objection to an arbitration; but as to the quality of the gas they did object to it, on this ground only—that the statute provided a way of proceeding against them in case the illuminating power of their gas did not reach 16 candles, which the Gas Examiner for the Board of Trade (Professor Tichborne) said it did. The statute provided that, in case of the quality of the gas being below the standard, any person might proceed to recover penalties against the Company.

The CHIEF BARON said that if the question were to be raised, it would be better to raise it in the usual way on demurrer. The Corporation, therefore, should plead in the ordinary way, and the Company, if they so desired, might put in a statement of claim or a statement in lieu thereof—the Corporation to plead to that, and then the Company could demur. In the meantime, the motion for a reference to arbitration would be allowed to stand.

GREENWICH POLICE COURT.—WEDNESDAY, MAY 8.

(*Before Mr.* FENWICK.)

THE PROVISION OF PROPER WATER-FITTINGS.

The hearing of the summons (adjourned from the 24th ult.) taken out by the Kent Water Company against Mr. John Durham, of No. 55, Drakefield Road, Brockley, for permitting waste of water at No. 24, Mary Ann's Buildings, Deptford, mentioned in the JOURNAL for the 30th ult., was resumed to day.

Mr. DICKSON, who appeared for the Company, explained that, although repairs had been made, new apparatus had not been provided in accordance with the regulations, as had been done in the previous cases.

In reply to his Worship, defendant stated that the repairs had been made at the time of the adjournment, and that, as the houses were coming down in about a twelvemonth's time, it was hard to ask him to put in new fittings.

Mr. DICKSON said the Company had no knowledge as to the houses coming down.

Defendant undertook to satisfy them as to the truth of his statement.

Mr. FENWICK said he would in that case adjourn the summons *sine die*, so that, if the houses were not pulled down, it could be revived on application; but conditionally on defendant undertaking that there should be no more waste, and that he would see that the tenants did not misuse the fittings.

GRATUITOUS ELECTRIC LIGHTING IN EXETER.—The Exeter Electric Light Company has offered, tradesmen first and private residents next, to supply light free for the first two months of the experiment.

Miscellaneous News.

ELECTRIC LIGHTING IN THE METROPOLIS.

BOARD OF TRADE INQUIRY.

(*Before Major* MARINDIN, C.M.G., R.E., *assisted by Captain* CARDEW.)

TENTH DAY—WEDNESDAY, APRIL 17.

Mr. RUSSELL GRIFFITHS, in opening the proceedings to-day, said that reference had been made to the question of the high tension which one of the Companies intended to introduce into the City. The possibility of a breakdown was as important to the local authorities as to electricians. He desired that his remarks should be taken as referring to the possibility, and not probability of such an occurrence.

Mr. *Henry Blake*, the Principal Clerk to the Commissioners of Sewers, examined by Mr. GRIFFITHS, said that he had been in the office for nearly 38 years, and had access to all the records of that office. They were of a very voluminous nature; and from them he had made a *précis* of the various works which had been carried out in the City for electric lighting under the Commissioners of Sewers, commencing in the year 1878. In the six years ending 1885, they had spent close upon £12,500 in respect of electric lighting schemes. There had been one or two contracts made with various companies for electric lighting; and in some of the tenders there were conditions as to private lighting in the City. There was a contract made with the Edison Company, which was to have come into operation in February, 1882; and under that contract the Edison Company arranged with the Commissioners of Sewers to use certain subways under the viaduct in Holborn, and the Commissioners were to place no difficulty in the way of the Company supplying private consumers. Lately there had been a contract with the Brush Company; and under that contract there were conditions for private as well as public lighting. He had a report from Colonel Haywood containing the various conditions.

Mr. GRIFFITHS: For that purpose the City was divided into three districts, and the specifications are to come in on the 10th of May. According to those specifications, the area of the City which is to be lighted is divided into three districts, as follows:—No. 1, the West District, comprises the area bounded on the north by the City boundary; on the east by Aldersgate Street, St. Martin's-le-Grand, St, Paul's Churchyard (north side), Creed Lane, and St. Andrew's Hill, and thence along Queen Victoria Street to Blackfriars Bridge; on the south by the Victoria Embankment; and on the west by the City boundary. No. 2, the Central District, comprises the area bounded on the north by the City boundary; on the east by Finsbury Pavement, Moorgate Street, Prince's Street, thence across Mansion House Street, along Walbrook and Dowgate Hill; on the south by the River Thames; and on the west by part of Upper Thames Street, St. Andrew's Hill, Creed Lane, St. Paul's Churchyard (north side), St. Martin's-le-Grand, and Aldersgate Street. No. 3, the East District, comprises the area bounded on the north and east sides by the City boundary; on the south side by the River Thames; and on the west side by Dowgate Hill, Walbrook, Prince's Street, Moorgate Street, and Finsbury Pavement. The whole of the main thoroughfares in each district are to be lighted; and the following is a list of those thoroughfares:—District No. 1 (West). Holborn, Holborn Viaduct, Newgate Street, Charterhouse Street, King Street, Long Lane, Snow Hill, Chancery Lane, Fetter Lane, St. Andrew Street, Shoe Lane, St. Bride Street, Farringdon Street, New Bridge Street, Old Bailey, Fleet Street, Ludgate Hill, St. Paul's Churchyard (north side). District No. 2 (Central), Barbican, Beech Street, Fore Street, London Wall, part of (west of Moorgate Street) Gresham Street, Cheapside, Poultry, Watling Street, Cannon Street, part of (west of Dowgate Hill) Queen Victoria Street, Upper Thames Street (west of Dowgate Hill), Aldersgate Street, St. Martin's-le-Grand, St Paul's Churchyard (south and east sides), Wood Street, King Street, Queen Street, Cripplegate Buildings, Milk Street, Aldermanbury and Aldermanbury Postern, Coleman Street, Basinghall Street. District No. 3 (East). Liverpool Street, Houndsditch, London Wall (east of Moorgate Street), Old and New Broad Streets, Bishopsgate Street Within and Without, Lothbury, Threadneedle Street, Cornhill, Leadenhall Street, Lombard Street, Fenchurch Street, Aldgate, Aldgate High Street, Gracechurch Street, Mansion House Street, King William Street, Cannon Street, part of (east of Dowgate Hill) Eastcheap, Great Tower Street, Upper Thames Street (east of Dowgate Hill), Lower Thames Street, Arthur Street East, Minories, Prince's Street, Moorgate Street, Finsbury Pavement, Arthur Street West, St. Mary's Axe. Then with reference to gas lighting, the learned Counsel said the City was originally lighted by three Companies—the Chartered Gas Company, which was incorporated in 1810; the City of London Gaslight and Coke Company, incorporated in 1817; and the Great Central Consumers' Gas Company, incorporated in 1847. The first two Companies had power to supply gas throughout the whole of the City. There was first open competition; but later on it was advised that districts should be assigned to the various Companies; and in the year 1860 an Act was passed under which districts were allotted. Although there was open competition, the price of gas was 15s. per 1000 cubic feet up to 1823. In 1848 for the districts which were allotted, the price had fallen to 6s. per 1000 cubic feet. In that year there was a further reduction to 5s.; and about Christmas, 1849, it came down to 4s. The Great Central Consumers' Gas Company brought in a Bill in 1849, but it was rejected; and in 1850 they made another application to Parliament, and obtained leave to supply gas in the City.

Witness was then further examined by Mr. GRIFFITHS, and said that he was well acquainted with the streets in the City, and had seen them opened in different places for the purpose of gas lighting, water supply, &c. There were a great many difficulties of various kinds; and judging from his knowledge of the condition of the streets, there would be great difficulty in opening them supposing there were two electric lighting companies endeavouring to lay down mains. The difficulty would depend greatly upon the depth they would have to go; and, of course, if they had to go below the gas-pipes it would greatly add to the trouble.

Mr. PEMBER then cross-examined the witness as to the specification to which Mr. Griffiths had alluded.

Mr. PEMBER: Whatever may be the powers of the Commissioners of Sewers to deal with the lighting of the City, that has not prevented the Gas Companies from occupying the ground there as well as in Belgravia, Westminster, and other parts of London.

Witness: No; they have got a monopoly of late years.

We know exactly how the Gas Companies operations are carried on; but the City is in fact treated in exactly the same way with regard to gas lighting as other parts of the Metropolis?—So far as I know it is.

As to the powers in respect to lighting, which, according to my learned friend Mr. Griffiths, the Commissioners of Sewers are said to have, there was nothing in the Act to exempt the City?—No.

That is what I shall argue with reference to electric lighting—the City is as much bound under the Metropolis Management Act as any other part of London. Were these specifications submitted to the Engineer?—They were drawn up by the Solicitor and Engineer together, I believe.

Do you know that in Parliament the question of competition between

electric lighting companies was discussed during the debate on the Electric Lighting Acts?—Yes.

And rejected?—I do not know; but I believe that it was left to the Board of Trade as an open question.

But your clause is intended to preclude other companies from coming in?—Yes, I suppose so.

Parliament also considered the questions of the price to be charged, and the duration of the life of electric lighting companies; and having made 21 years as the duration of the life of an electric lighting company, the Legislature in 1888 altered it to 42 years?—But that limitation of 21 years does not interfere with the provision of private lighting.

Cross-examined by Mr. LITTLETON, the witness stated that applications had been made for 13,600 lamps in the City; and he understood that 130,000 would be guaranteed. The Commissioners of Sewers would have to be satisfied with the Provisional Orders of any company before they would give their consent to the undertakers.

Re-examined by Mr. GRIFFITHS, witness stated that the specifications referred to tenders for a private contract with the Commissioners of Sewers, and could be altered at any time if the tenders were accepted. They did not pretend to be under the Act.

Mr. *W. H. Preece*, examined by Mr. GRIFFITHS, stated that he was the Chief Electrician to the General Post Office, and that he had been associated for purposes of consultation on questions of electricity with the City Commissioners of Sewers since 1882. There were 24,893 inhabited houses within the City radius according to the census of 1881; and a residential population of 261,061. This number was greatly increased during the daytime. About 800,000 persons, it had been ascertained, now entered the City every day. There were a great many places in the City which would require artificial light during the day as well as by night.

Mr. PEMBER: Your figures bring the total population to above a million.

Mr. GRIFFITHS: Yes. (To witness) Nearly every available spot in the City being used for offices or other purposes, necessitating lighting in some way, makes the use of electric light in the daytime of more interest and greater importance than in any other place. Have you estimated the present number of gas-lamps in the City?

Witness: Yes; the estimate for private and ordinary purposes is 622,000.

Mr. PEMBER: Do you mean gas-burners?—Yes; gas-burners averaging 5 feet per hour per burner.

Mr. GRIFFITHS: There are 3136 public lamps in the City, costing the Commissioners £10,530 per annum.

Witness: Yes.

What is the time in the City during which the lighting would be required for private purposes?—Up to about 7 o'clock. The great bulk of the private lighting is up to about that time.

And a good deal of light is wanted in the City at night as well as in the day?—Yes, a great deal. I have in my mind one case—that of the Post Office—which illustrates a good many. There are also printing and other works which burnt light all night.

Examination continued: It was difficult to form an accurate estimate of the number of hours of lighting in the City. The only case from which a conclusion could be drawn was that of the central station in New York started by the Edison Company in the neighbourhood of Wall Street—a district somewhat similar to the City. The average number of hours per lamp during which light was consumed in New York worked out at 2·4 hours per day, or 870 per year, and that was a fair estimate of the amount of private lighting in offices, restaurants, &c., required in the City. In New York the latitude was 41, and in London 52; and this difference of latitude would add about an hour to the average length of lighting in the City of London. That gave a daily average in London of 3·5 hours. He doubted whether it was fair to draw any comparison whatever between the private lighting of the City and of residential places like Kensington and Wimbledon. In a bank or in a club nearly all the lamps were lighted at once; but in a private house in the suburbs, a number of lamps were lighted in a few rooms for a short time. He had read the evidence of Mr. Crompton as to the demand for the light in the West End. Mr. Crompton said that the chief demand in the City was from 5 to 7 o'clock. If one company had to supply the residential portion of the West End, and the shops and theatres, and also to meet the demands for the City between 5 and 7, he believed the demands of the two places would overlap. The consequence of overlapping would depend upon the plant. If the electric light was dependent upon running machinery without any storeage, there would be great difficulty in furnishing the double light, and extra machinery would have to be provided, which would have to stand idle until the time came for the great pressure. Machinery running what was termed "light"—*i.e.*, at less than its full power—always ran uneconomically.

Mr. GRIFFITHS: What is the mileage of the streets in the City?

Witness: There are over 46 miles of streets.

If there was a single main, there would be 46 miles of it; but if there was a double main, it would be 92 miles; and for two competing companies there would have to be 184 miles of main to light the streets?—Yes, supposing they were all streets; but the 46 miles includes courts and alleys. Eliminating them, there would be 33¾ miles.

Have you formed any estimate for the lighting of the whole of the public streets as to the number of electric-lamps required to replace the existing gas-lamps?—Yes. I estimate that there would be required 500 of what are called Watt arc lamps, and also 1000 glow, or what are termed incandescent lamps. The latter would be of from 25 to 32 candle power; and their size would depend upon the space over which the lamps would have to illuminate.

Have you formed any estimate of the number of lamps for private lighting which would probably be taken in the City?—Yes; I take the estimate of 622,000 gas-lamps as the existing supply; and we may fairly estimate, with the competition that must take place between the gas and the electric lighting companies, that we should get one-third—that is about 210,000 lamps in the City. This would give about 70,000 for each of the three districts in the City.

What candle power would these be?—About 10 candles.

We have heard that you have had some experience of electric lighting at the Post Office?—Yes.

Examination continued: The General Post Office was partially lighted by electricity; and it had its own installation, which had been put up under his superintendence and advice. The cost per Board of Trade unit of lighting the Post Office was 3½d.; but the engines used at present were not the most economical, and with more modern machinery, he believed the cost would be reduced to 2½d. There were a great number of private electric lighting installations in the City. He had been consulted as to certain specifications which the City authorities proposed to issue; and he quite approved of the proposed conditions contained in them. He had considered the scheme suggested by the London Electric Supply Corporation for the transmission of electricity at a very high pressure from Deptford to London; and he looked upon it as a gigantic experiment. Generally he was a decided advocate of the distribution of electricity over extended districts by alternate currents. There was almost as much to be said in favour of one large station down the river as there was in favour of several stations spread over a district and his strong objection to the scheme of the London Electric Supply Corporation was not the question of several stations, which could be perfectly well worked out, but the connection between Deptford and London by means of mains. He would say emphatically that he regarded that part of the proposal as very objectionable indeed. He had heard the evidence of Lord Crawford and of Mr. Ferranti as to the dynamo driving with 10,000-horse power; and he considered it was possible not only to have a dynamo of 10,000-horse power, but to make engines and dynamos of 20,000-horse power. In transporting the converted energy from Deptford to London, he anticipated great difficulties. There were difficulties of installation, difficulties of joints, and above all difficulties of disturbance of telephones and telegraph. There was no difficulty in connecting electric supply lines with distributing mains, which were to be the same as the trunk mains. The difficulty was simply in the connection between the dynamos and the large transformer at the distributing station in London. He had not seen a motor which could be applied to the alternating system. Two or three were spoken of as being in existence; but they had not as yet been produced. An American invention had been spoken of a great deal; but it was not in the market yet. There were motors for using the energy supplied by the direct system. There would, in his opinion, be a very large demand in the City for motor power supplied by electricity; and that would be a remunerative source of income to the electric light companies. The main reason which controlled the Commissioners of Sewers in recommending the subdivision of the City into three districts was that they were giving the public the benefit of competition, while the City authorities themselves would be prevented from suffering from the very greatest of all inconveniences of competition—the cutting up of the streets by rival companies. The main streets of the City taking Holborn, Newgate Street, Cheapside, and Fleet Street as instances, were at the present moment completely choked. The Post Office had in Cheapside from 15 to 20 different pipes of its own; and it would be almost impossible at the present time to lay a new 6-inch main down that thoroughfare. One objection to competition was that if there were two companies passing down one street, there were double mains, double plant, and double capital; and sooner or later the competition led to amalgamation. This led to an enhanced price to the public, and so in the end the public had to pay. On the other hand competition, or the fear of competition, secured splendid services; and he was convinced that the proposed system would obtain a good supply. "Potential competition" was a very excellent term, and was just the sort of competition the City authorities were anxious to see. There would be especial danger of leakage with the rigid mains; and he should like to draw a distinction between danger to persons and danger to telephones and telegraphs. As regarded danger to persons, no more effective mode of mains could be suggested than that proposed by Mr. Ferranti; but the difficulty was that the telephones of London would suffer if the main from Deptford to London formed a curve. With a 10,000-volt power and the original main as proposed by Mr. Ferranti, there was not a single telephone in London which would not be disturbed by the alternating currents from Deptford so much as to prevent speech. The proposed maximum unit of price was 8d.; and he anticipated in the progress of electrical knowledge, that electric energy would in future be produced at a much less cost. There was a regular wave of progress tending towards economy. During the last five years, there had been enormous strides in electrical knowledge; and there had been occurrences which from time to time had reduced the cost of production. The cost of dynamos had diminished a third, and the output of dynamos had increased three times; so that in this one item, they would save nine times as much as three years ago. They might anticipate continued progress, but not at that rapid rate.

Cross-examined by Mr. PEMBER: Your insulation joint disturbance and electrostatic induction really all hang together?

Witness; Yes.

It comes to this—if in your judgment there is a cable uninsulated on the outside adopted at Deptford, the part not connected with the earth would set up electric induction, and cause disturbance to telephones even to the extent of affecting the speaking?—Yes.

That depends upon there being a curve between London and Deptford?—Yes.

If we get an absolute straight line that electrostatic induction would not be set up?—No; but earth conduction could be effected.

If there was a straight line, would there be any disturbance?—Yes.

Very slight?—No; very considerable.

You have discussed the matters very amicably with Lord Crawford and Mr. Ferranti; and they have told me that they desire to meet the objections of the Post Office, and that they are not wedded to this particular form of main?—Yes.

And the amount of insulation necessary to meet the Post Office requirements, and also the safety of the public, was considered between you?—No; we have not yet discussed that.

Were you not aware that the Corporation had even ordered, procured, and were laying down an experimental main for the express purpose of meeting the conjoint objections of the safety of the public and the burying of the uninsulated main in the earth?—No. I was aware that we had both expressed our wishes to thrash out the question of experiments.

Have you any doubt really that a cable carrying their current from Deptford to London can be made which shall get rid of what I call the Post Office objections?—None whatever.

And yet ensure safety to the public?—Yes.

Major MARINDIN: Of course, the Post Office have nothing to do with the safety of the public. That is a matter which the Board of Trade have to see to, I think.

Mr. PEMBER: Quite so, Sir; but I am treating the evidence of this gentleman as that of a highly scientific witness; and he says, perfectly frankly, that he has no doubt that a cable which combines those two advantages can be made. (To witness:) When that is done, any objection that you have seen to the adoption of the London Electric Supply Corporation scheme vanishes?—Certainly.

How does London compare with New York in regard to fogs?—They never have a fog in New York.

When you gave the number of gas-burners in private houses as 622,000, did you include the gas-burners which exist in institutions which provide installations for electricity?—Yes.

Captain CARDEW: With reference to the interference with the telephones, would that be from electrostatic induction.

Witness: Yes.

Mr. SHIRESS WILL, in opening the case for the House-to-House Electric Light Company, stated that they were seeking for a Licence and for a Provisional Order to light the districts of Chelsea and South Kensington. It was a Company which was formed in January, 1888; and the shareholders composing it would be able to raise the necessary capital if the Provisional Order were granted. It had established a station at Lillie Bridge, and had secured ground 470 feet long by 60 feet wide; and in regard to the situation, it would be found quite free from any of the objections which had been raised as to the possibility of noise arising from vibration.

There were three engines at work; and the machinery was of the most complete character. Each set of plant was capable of supplying electricity for 4000 incandescent lamps; and the completed station would contain twelve such sets. This would give a capacity of 48,000 incandescent lamps, representing about 100,000 lamps installed. The Company were tied to no system; but they had commenced with that known as the high-tension alternating current converter system, which he believed was best for the public and the companies. As regarded their area, they were asking both for a Licence and for a Provisional Order; and the circumstances would be found to justify them in so doing. The local authority had given their consent for a portion of the area; and they were asking for a Licence for another portion. They were actually at present in operation, and supplying a portion of the area. In the interests of both the public and the companies, he distinctly advocated districting; and therefore was against competition, unless it were afterwards found to be necessary. It would be better to allow each company a district for them to light, as that would be best in the interests of London for various reasons, and especially in preventing the breaking up of the streets too much. There was at present the very efficient competition of gas, which could not be destroyed. Districting would enable the expenditure to be kept down; whereas if there were several companies allowed in the same district, they would ultimately probably have to amalgamate, and that would be injurious to the public. The whole difficulty in this country with regard to House-to-House Electric Lighting had not been a scientific but a commercial one, and that difficulty was entirely due to the cost of the battery and the low-tension system. The greater advantages of the system the House-to-House Company adopted was illustrated by the fact that it was in general use all over the world. He did not say that the battery system was bad; but it could not be thoroughly relied upon. The high-tension alternating current converter, or the transformer system, as applied to high-tension alternating currents, was rapidly coming into use in America, and supplanting the other systems. In England it was at work, at Brighton, and at Eastbourne—at Brighton with the aid of overhead wires, and at Eastbourne with the aid of underground wires. The transformer might burn out, and evidence had been given of such burns out. That was because the insulation was not perfect; but the transformers of the House-to-House Company would not be able to burn out, because, before a transformer began to burn, some part of the wire went before anything else; and the moment that occurred, it would demand more electricity from the main behind it which supplied it, and a fuse would be put upon it, so that by means of another fuse they would get absolute safety. After alluding to the objection of insurance companies in America to the transformer system, the learned Counsel said as to the question of whether there should be small companies extending over different areas, or whether London should be handed over to a large Company, that the proper system was to have one company within the district confined to the work of that particular district, rather than one a long way off, because the latter was neither a good nor an economical method.

Mr. *Robert Hammond* was then called, and stated that he was Managing Director of the House-to-House, the Chairman of the Brighton and Hove, and the Managing Director of the Eastbourne Electric Lighting Companies. He had been engaged for some years in the business of house-to-house lighting, and in producing electricity. The nominal capital of the House-to-House Company was £100,000, and £41,000 had been subscribed. They had works erected at Lillie Bridge on the confines of the parish of St. Mary Abbott's, in a neighbourhood which would secure immunity from disturbance. The witness corroborated the opening statement of the learned Counsel as to the system to be adopted and the machinery and plant, and also as to districting being favourable alike to consumers and the Companies. He considered that the fixing of a standard price to be charged for the electric light would also be of advantage to both. This could not now be done; but it could later on when they had more information on the subject. Such standard should not, he thought, be fixed until after the expiration of seven years. The standard price should be fixed by basing it on the dividend. There should be a dividend of 10 per cent. fixed as the maximum; and then with any increase of dividend, there should be a reduction in price—thus following the analogy of recent gas legislation.

In answer to Mr. MOULTON, witness stated that his Company were satisfied with the district allotted to them. They were, however, ready to take up an extension of their area upon the failure of any of the Companies to which the other part of the district had been allotted by the local authorities.

In answer to Mr. WALLACE, witness said they only started last year at Brighton to run the engines night and day; and the cost of the production of electricity amounted to 6½d. per unit last year. This included the cost of the converter system and part of the Brush system.

Mr. WALLACE: Can you tell me the cost per unit the year before?

Witness: No; I cannot.

The system adopted at Brighton cost 6½d. per unit?—Yes, last year. But the works at Brighton are very small; and it is marvellous to make electricity at that cost per unit only running 600-horse power.

How many lights?—About 10,000.

That does not include any capital charges, or depreciation, or secretarial expenses, &c.?—No.

How many lamps do you light from your station at West Brompton?—We are running, I think, about 500.

What is the cost of running the 500 per unit? Would it come to about 20s.?—I should not think quite so much as that.

What do you propose to charge under the Order?—We propose to have a sliding scale according to the number of hours a man uses his lights—a system which I hope will be universally decided upon. We ask him to fix his maximum supply demand; and we do all we can to increase the number of lights. We charge a sliding scale on this basis: For the first 100 hours maximum demand, 1s.; the second 100 hours, 8d.; and all beyond, 4d. If he uses the light five hours a night, he gets it very cheap indeed.

You allow him to fix his maximum?—Yes. We put in the converter.

Mr. *William Lowrie*, the Engineer of the House-to-House Company, in answer to Mr. SHIRESS WILL and Mr. WALLACE, gave a few particulars of the Company's operations at Brighton and Eastbourne, and said that directly they obtained the Provisional Order, and they had a sufficient number of customers, they would run night and day at Kensington.

Professor *Forbes*, re-called, stated, in reply to Mr. WILL, that he had visited the station of the House-to-House Company at Lillie Bridge. From a general view of the condition of the district of Kensington, he should say that the alternating system of converters would be the best method of lighting.

Mr. WILL: That concludes my case.

The inquiry was adjourned.

ELEVENTH DAY—THURSDAY, APRIL 18.

Professor *Crookes*, F.R.S., re-examined by Mr. WALLACE, said he was Chairman of the Notting Hill Electric Lighting Company, Vice-President of the Institute of Electrical Engineers, and President of the Chemical Society. He resided at Notting Hill; and with several other friends in the neighbourhood, had arranged to form a Company to supply themselves with electric light. His house had been lighted by a private installation for the last seven or eight years. They arranged to raise sufficient capital to meet the preliminary expenses of the undertaking; but at present they had not made any effort to obtain money from the public. The nominal capital of the Company was £100,000. It might be regarded as a private concern, as it was not promoted to make a profit, but simply to introduce the electric light. The promoters were prepared to subscribe sufficient capital to start the works, and to carry out the directions of the Provisional Order if it were granted. He did not anticipate the slightest difficulty in raising all the capital required. They had not yet purchased a site; but they knew where a suitable one could be obtained when necessary. They had had considerable negotiations with the Vestry of St. Mary Abbotts, Kensington; and inquiries had been going on for twelve months with regard to the financial capabilities of the Company. The Vestry wished to be thoroughly satisfied with the *bona fides* of the concern. There was now no opposition to the Company, as it had been satisfied during the inquiry. They only desired to light a portion of the parish; but if they had power, they would be able to light the whole.

In reply to the Counsel representing the Vestry, witness said that the question as to whether the Company sought an absolute monopoly of the area in their Provisional Order was a legal point. He did not think he could say one way or the other.

Mr. WALLACE stated that the Company did not object, in the event of their failing to do the lighting properly, to other companies coming into the area. But before they were admitted, the Chelsea Company would like to be heard in opposition; for so long as they did the work efficiently, they did not want any other company to come into the district. In the event, however, of its being alleged that they had failed, there should be a proper inquiry held by the Board of Trade to see if the allegations were well founded.

Major MARINDIN: Your capital is £100,000?

Witness: Yes.

Has anything been subscribed?—The Directors have subscribed for 15 shares each, which is sufficient to meet all the preliminary expenses.

Are there any Articles of Association?—Oh, yes; everything has been carried out properly.

Mr. WALLACE then opened the case for the Kensington and Knightsbridge Company. He remarked that it had been in existence a year and a half, having bought the undertaking of the Kensington Court Electric Lighting Company; and the two Companies now asked for practically the same area. They had two stations in the area—one situated at Kensington Court, and the other on the north side of the Brompton Road. The area, which covered only one square mile, included Kensington Palace Gardens; and went along High Street, Kensington, to the French Embassy, and then followed the line of the Brompton Road to South Kensington and Chelsea. They had laid their mains in a portion of the area, and had been at work during the last three years. There was a slight difference between the course the Kensington Company advocated and the policy recommended by the promoters of the other companies. The principles proposed by the promoters were objected to by three parties. First, there were those persons who desired to have concurrent powers over the same area; then there were those who favoured districting; and lastly there were those who urged that the promoters of the Company should be resident, and that the capital of the undertaking should be raised as far as possible within the district, and that the stations should be situated close to the area of supply. This last was the policy which the Kensington Company advocated; and considering the congested districts, they objected to having a rival within the area, as they considered that districting was the best plan. If they were to have opposing companies in the same district, they would take up the very streets where the traffic was congested, because there were more shops and more lights required; and the Brompton Road would be the very place which promoting companies would most likely get at, and make their battle-ground. It was no advantage to the public to have rival companies; and when they came to the question of price, it would appear, from the evidence which had been given, that it would not reduce the price to have to keep up double the amount of plant necessary to do the work. Unless it was arranged that there should not be more than two companies competing, there would certainly ultimately be a monopoly. If there was to be competition, the only plan would be to arrange which of the streets each company should serve. With regard to the question of concurrent powers, he thought it right to mention that in the Kensington district there were streets very similar to the streets that had been spoken of by the Local Authorities of the Strand and other districts. As to the question of nuisance, which was the principal objection raised against their own and the London, Metropolitan, and other Companies, who advocated inland stations instead of having them on the riverside, his Company had provided means of preventing any nuisance in condensing the steam; and with regard to smoke, they would use Welsh coal, and consume their own smoke. They could also obviate nuisance from vibration if they used a certain kind of engine. With regard to safety, their system was the best of the companies in respect to that. High Street, Kensington, was a very narrow thoroughfare, in which the traffic was greatly congested; and there were under the roadway a large number of mains similar to those in the Strand. His Company had specially considered, and had had more experience than any other company in London in connection with breaking up streets and laying mains underneath; and unless a scheme for making a subway for containing the mains of all the competing companies in the same district could be arranged, there would be very great difficulties. When they were not able to obtain from the Vestry a Licence for Kensington, they obtained a Knightsbridge Licence, and commenced operations for lighting. They went up Kensington Palace Gardens, and lighted most of the large mansions; and many of the occupiers who had their own installations before, had found it to be cheaper to have the light from the Company. Then they lighted the Parish Church of St. Mary Abbotts, and also the shops in High Street, Kensington. The people at Queen's Gate finding the Company had not a Licence from the Vestry made rather a fuss about the matter; and a deputation waited on the Vestry to ask for a Licence for the Company to light Queen's Gate; and it was only on the previous day that the Board of Trade had granted it. They were now supplying electricity satisfactorily to everybody. From the commencement of their undertaking to meet the public want of a supply of electricity, they had not had any failure of the light, except for a few hours on one occasion. But this was due to the fault of one of their batteries; and nothing of the kind was ever likely to occur again. This he believed was a record which had not previously been put before the Board of Trade. The Company had had a number of applications for the supply of the electric light; and he trusted the Board would grant their Provisional Order.

Mr. *R. S. Erskine*, Secretary of the Kensington Electric Light Company, examined by Mr. WALLACE, said that a Licence had been granted for a portion of the district some time ago, and a further Licence was

granted by the Board of Trade; so that now the greater portion of the district—considerably more than half—for which they were asking for a Provisional Order, was covered by Licences. To meet the requirements of the district, it was decided in the summer of 1888 to increase the nominal capital of the Company to a quarter of a million. There had been no public subscription, as all the money had been provided by the Directors; and from £37,000 to £38,000 had been paid up. The works could go on as soon as the Order was obtained. The only competitor they had in the district was the Metropolitan Company. After describing the position of the mains and the houses in the district, witness stated that the number of houses required to be lighted in some of the streets was so small that it would not pay the Company to serve them; but in the main streets they would get a fair number of lights.

Mr. WALLACE: What would be the advantage to the people of Egerton Gardens if they were supplied with light by the Kensington instead of by the Chelsea Company.

Witness: The lights would be much steadier; and, in case of a fog, we should be able to meet the demand better than the other Company.

Mr. A. C. CRIPPS: Your 1888 Licence is for St. Margaret's and a portion of the district for which the Metropolitan Company seek powers?

Witness: It is for all the outlying portions of St. Margaret's, Westminster.

Mr. WALLACE: No; it does not include the parks. It is for all the inhabited portion of the district.

In reply to Mr. CRIPPS, witness added that, within a small amount of that which had been paid up, substantially the whole of the subscribed capital had been expended.

Mr. SHIRESS WILL: What is your nominal capital altogether?

Witness: £250,000.

How much of that is subscribed?—Between £37,000 and 38,000.

Mr. *F. Radford*, called on behalf of the Notting Hill Electric Light Company, said he was a Director of the Company, and resided in their district. The Directors were ready to find the necessary capital for the lighting of the area specified in the Order; and he knew of two suitable sites on which to erect the necessary works.

Mr. *A. E. Loughborough*, agent for the Company, produced the Articles of Association, and read the names of several of the subscribers, all of whom, he said, resided within the district. These were the only shareholders.

Mr. WALLACE said that others were prepared to join the Company when the Order was granted.

Major MARINDIN: Are you satisfied that the capital is sufficient.

Witness: Yes.

Mr. WALLACE next opened the case of the Westminster Electric Supply Corporation, which he said was in the same position as the Notting Hill Company, with the exception that sites for the works had been obtained. As the undertakers proposed to work on precisely the same system as the Kensington and Knightsbridge Company, it was unnecessary for him to prolong the inquiry by making an address. Unfortunately, during the course of the investigation, the Clerk had died, and the witnesses had gone out of town.

Major MARINDIN: But there is considerable opposition to this Order.

Mr. WALLACE: The only opposing Companies are the London, the Metropolitan, and the Chelsea; they being the only competing Companies in the district.

Major MARINDIN remarked that they were three very important ones.

Mr. WALLACE then said he could not profitably occupy time beyond explaining the system the Company proposed. They had a site at Victoria Mansions, and had placed boilers there. They intended that this station should not be a permanent one, but that it should afterwards be used as a battery station. The demand for electric light was not very large at present; but the Company proposed to light provisionally, and keep the plant there to assist the battery stations. They purposed lighting up the district from two other works—one in St. Margaret's parish, and the other in St. George's, Hanover Square. The only difficulty they had—and it was one which concerned the London Company as well—was that of lighting Mayfair, which was a considerable distance from either of the stations. They proposed to have battery stations in the area of Mayfair; and these would require to be supplied by mains from the central station, in the same way as the other companies managed. As to causing any nuisance, they compared favourably, in the choice of their site with the Metropolitan Company.

The inquiry was then adjourned until April 24.

SALE OF SHARES IN THE REDHILL GAS COMPANY.—Forty £5 shares, fully paid, in the Redhill Gas Company, were recently sold at prices varying from £10 17s. 6d. to £11 each.

NEW ELECTRIC LIGHTING COMPANIES.—Two new electric lighting companies have just been registered—one, with a capital of £5000, in £1 shares, for lighting Keswick, in Cumberland; and the other, with a capital of £10,000, in £5 shares, for supplying electricity for lighting and motive power in Pontypridd and Ystradyfodwg, in Glamorganshire. The *Financial News* states that an international company has been started in Vienna, for the purpose of supplying the streets and private houses with the electric light at the least possible cost. The capital of the concern is 5,000,000 florins.

ACCIDENT AT THE ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.—Last Friday week an accident occurred at the works of the Alliance and Dublin Consumers' Gas Company. The Company have recently made arrangements for the manufacture of sulphate of ammonia, and when the new works were being operated for the first time on Friday, through some misadventure, a large quantity of vitriol was ejected from the vat. The liquid caught in its descent four persons whom it very seriously injured—Mr. Waterfield, the Company's Engineer, Mr. Browning, the Assistant Engineer, and two labourers, named Reilly and Nolan. The two first-named gentlemen promptly received medical assistance, and were able to proceed to their homes. The injuries of the two labourers were very serious; and they were conveyed to the hospital.

NORTHERN COAL TRADE.—There has been an abnormal increase in the demand for coal during the last few days, though it is not expected to be of long duration. It is due to the receipt of orders for coal and coke in consequence of the strike in Germany. A considerable amount of both these articles has been purchased at high prices; and part of it has been sent to Hamburg, Antwerp, and Bremerhaven, whilst more will soon be despatched. Steam coal has hardened in price, and is now quoted at 10s. for best Northumbrian qualities. Small coal is scarce at 4s. per ton. For gas coal the demand is brisk for the season, and for the best qualities higher rates are asked; 8s. net being at times demanded. Contracts are now more fully desired to be supplied than was the case a week or two ago. In other kinds of coal, there is little change. In coke, however, the demand is now so large that sales have taken place at 17s. per ton, which is about 2s. 6d. above the rate of a few days ago; and it is believed that higher prices will have to be paid. Gas coke is well taken up, both for export and for local consumption, especially at the cement works.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Meeting of this Association was held last Tuesday, at the Cannon Street Hotel—Sir JULIAN GOLDSMID, Bart., M.P., in the chair.

The SECRETARY (Mr. R. S. Gardiner) read the notice convening the meeting, and the seal was affixed to the register of shareholders. He afterwards read the following report:—

The present half-yearly ordinary general meeting of the proprietors has been convened in conformity with the Association's Acts of Parliament for the purpose of receiving a report from the Directors upon the affairs of the Company and of declaring a dividend for the half year ended the 31st of December, 1888.

The following summary shows the results of the Association's operations during that period:—

	Cubic Feet.
The quantity of gas made in the half year ended the 31st of December last was	3,942,000,000
The quantity made in the corresponding half year of 1887 was	3,759,000,000
Being an increase of	183,000,000

Or at the rate of 4·87 per cent.

The total number of lights on the 31st of December last amounted to 1,764,887; there being at that date 127,080 consumers on the books of the Association. At the close of the corresponding half year of 1887, the number of lights was 1,687,372. These figures give an increase of 77,515; or at the rate of 4·59 per cent.

The entire length of mains laid on the 31st of December last was 1470 miles. The length of mains laid on the 31st of December, 1887, was 1426 miles; showing an increase of 44 miles.

A comparison of the cost of the coal employed during the half year with that of the coal used in the corresponding period of 1887 exhibits a decrease of 2·64d per ton.

The value of residuals was well maintained, both coke and tar showing an advance in price, and the revenue derived from the sale or treatment of ammoniacal liquor remaining about the same.

Both the rental for the half year under review, and the profit made during that period show satisfactory progress.

The plant and mains at all the stations were maintained in a due state of efficiency.

The extensions on the Association's Gitschiner Strasse works at Berlin made further progress towards completion.

It has been found necessary to enlarge the works at Hanover, in consequence of the increasing development of the consumption of gas at that station. It has therefore been determined to build a new retort-house and a new purifier-house and to add two lifts to the gasholder erected there in 1886.

The increased sale of gas at Vienna has made it necessary to provide additional gasholder room there also; and a three-lift holder 205 feet in diameter is in course of erection on the Association's Tabor works.

A piece of land was purchased at Lille for the purpose of erecting upon it new offices and a show-room.

A small portion of the Association's property at Toulouse was disposed of on favourable terms.

The Directors have to report that they have secured the Concession for the lighting of the Commune of Uccle—a suburb of Brussels, adjoining the districts already lighted by the Association. They have also acquired the concession and gas-works for the lighting of Neu Weissensee—a suburb of Berlin. New contracts were concluded with the Municipalities of Pötzleinsdorf and Jedlesee—suburban communes of Vienna.

The Directors desire in conclusion to draw the attention of the proprietors to the accounts for the half year ended the 31st of December last. These have been duly audited; and, from them, the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—namely, a dividend of 5 per cent. for the half year ended the 31st of December last, payable free of income-tax on and after the 1st day of June next.

The Directors who go out of Office by rotation are:—H. Wood, Esq., J. H. Palmer, Esq., H. M'Lauchlan Backler, Esq. These gentlemen are eligible for re-election, and offer themselves accordingly. The Auditor who goes out of office by rotation is J. Sebag Montefiore, Esq., who is eligible for re-election, and offers himself accordingly.

In consequence of the lamented death of Mr. Rowland Hill, a vacancy has arisen in the said office of Auditor, which it rests with the proprietors to fill up. Mr. M. S. Pilcher has given notice of his intention to offer himself as a candidate.

The CHAIRMAN: I have to move—"That the report which has just been read be received, adopted, and entered on the minutes." In so doing, I have very little to say; the report speaks for itself. The Company is in a state of prosperity, which is satisfactory to the Directors and the proprietors. We have made a very considerable addition to the profits in the course of the half year; and I think the whole report shows that the Company is in a most solid condition and can be thoroughly relied upon in the future as it has been in the past. We have had some things which have been especially favourable in the course of the past half year. Coal was remarkably cheap; and freight was very low. We must expect some rise in coal owing to the more fortunate condition of trade in this country; and we all know that there has been a considerable addition to the freight of shipping going to all parts of the world. This has added so materially to the prosperity of many of our fellow-citizens that, although it will take some small portion of our profits, it will not affect our dividend; and I think we cannot complain considering under what favourable circumstances we have worked for some years past. In other respects I can only say that I see no reason why the prosperity which has attended us in the past should not continue to attend us in the future. We have at various times, as you know, had alarms of different kinds. I remember there was a time, for instance, when the shareholders of this Association—as of all other gas companies—were terribly alarmed in consequence of the introduction of the electric light. I ventured at that time to point out that, in my opinion, any progress which was made by the electric light would not injure gas companies at all, but would rather promote and increase their business. The experience of the last five years goes to show that this statement on my part was by no means an exaggeration. Well, in the same way, gentlemen, I think I may fairly tell you that the extraordinary—I had almost said the ridiculous faith which some people, some credulous people, seem to entertain in that new old invention, water gas, will no more affect our future prosperity than the electric light terror did a few years ago. In fact, if you ask my opinion, water gas was invented long ago, and a great many companies were established in England and on the Continent to supply it; but all of them failed to succeed. I do not know that any one of them paid such absurd premiums as are paid now for the benefit of particular patents or particular inventions. But if you pay a high price for the benefit of a particular patent or a particular invention, you are burdening to that extent the future income of the company, whatever that may be, and adding a very heavy charge, which has to be met before the shareholders can realize any reasonable profit. All I can say is that the invention of water gas is such a very old one that I do not think it can at all interfere with the profits of a coal gas company; and I should strongly advise the shareholders of this Company who have had some faith in myself and my colleagues, not to think of purchasing at these high prices. So much then for rival claims. All I can say is this that we endeavour in every respect to meet the reasonable requirements of the consumers and the municipalities whom we serve; and I believe I may say that, if not in all, in the great majority of cases, our efforts are appreciated by those whom we supply; and I think the Company has no reason to complain of the prosperity which has attended the work we are

carrying on. I am happy to say that all the Directors, except one, who has been away on account of ill-health (Mr. Palmer), and who has been of great service to the Association in past years, are able to be here to-day. They have all devoted, as you know they have always done, great care and attention to the business of the Company; and I think I may say on their behalf that I am certain you could not have had greater attention paid to the interests of the shareholders than they have given in the course of the past half year. I do not know that there is anything for me to add. I proposed to make the shortest speech I ever made in this chair; and I think I have been successful, although I have to say now, as I have always had, that I am ready to answer any reasonable question. I do not think it is necessary for me at present to detain you longer; and therefore I propose the motion with which I commenced my remarks.

Mr. Wood briefly seconded the motion.

Mr. Bradfield asked if any improvement had taken place in the electric lighting which the Company supplied at Vienna.

Mr. Greville Palmer, after avowing that he was not one of those who had such little faith in the future of the electric light as the Chairman, expressed his opinion that the electric light, as far as could be seen, had been in its infancy during the period of its establishment; that it was now making great leaps and bounds; and that it was a rival which the gas companies would have to deal with some day. His family had always held very largely in the Imperial Continental Gas Association; therefore it constantly happened to him and his friends to be asked questions with respect to the electric light. When he had inquired of any of the Directors, especially his cousin, who was on the directorate, he had always been told that it mattered very little to the Association what the electric light did. If it was successful, all their contracts, or such of them as had been renewed within any reasonable period, provided that in the event of the electric light coming to anything, and their being desired by any of the municipalities whom they supplied to do so, they had the first right to supply the electric light. He wished to know whether the Directors made any use of that privilege, because he had reason to believe that there were cases in which they had been asked to try experimentally the electric light, and they were not doing so, but had let others take their place. He also wanted to know whether something could not be done at any rate to keep pace with the demands of the municipalities where they were established in the event of the electric light being required.

Mr. Weir asked whether the expenses in extending the works at Hanover would be large.

Mr. Rokeby Price, referring to Mr. Palmer's remarks, stated that the late Sir William Siemens, like himself (the speaker), belonged to the City and Guilds of London Institute; and they appointed a Sub-Committee to make a report as to whether or not they should teach the students the nature and the application of gas, and the nature of electricity, and the application of electricity. That Committee reported in a manner derogatory to gas. Sir William Siemens (he was then Mr. Siemens) had not entered the room before. But when he came in, he sat next to him (the speaker); and he told the deceased gentleman what had happened. Sir William then said that he had come on purpose to give his opinion on this subject. He said he was very sorry to oppose a report so carefully drawn by a Sub-Committee; but he added that he considered nothing could be of greater disadvantage to the Institute than to put aside the teaching of gas and its application; and he wound up by saying: "You are aware I am a Gas Engineer and an Electric Light Engineer"—for he was then lighting part of the Poultry and London Bridge by electricity—and, he continued: "My opinion is that gas is more in its infancy than electricity. Nothing new has been found out since Farraday's time about electric influences. That it will be supplied, I believe; but gas has a greater field before it, in my opinion, than electricity."

Mr. George Livesey: I cannot allow the remarks of Mr. Palmer to pass without some degree of protest; and I think the very fact that you, Mr. Chairman, omitted all reference to your electric lighting experiment at Vienna is rather ominous as to the suggestion made by Mr. Palmer. I have understood—how true it is I do not know—that something approaching £300,000 has been spent by the Company to carry out this electric lighting experiment in Vienna; and so far I have not heard that any profit whatever has been derived from it. My own opinion is that, when once a gas company dabbles in electricity, it becomes a stepmother to gas. It is anxious to promote the success of electricity, and therefore anxious to promote the success of what many people regard as its greatest rival. My own opinion is that gas is on a perfectly sound footing; that it can stand alone; and that, if any municipality or town wishes the electric light, let them have it, but do not let them have it at the expense of gas shareholders. Let money for the electric light be provided by those who choose to put their money into such a speculative affair; and let us go on our course evenly, regardless of what they are doing. I am perfectly certain that we should be able to hold our own. Gas has such a multiplicity of uses; and gas companies have had such an easy time during all these years that, if they put their shoulders to the wheel like ordinary tradesmen, and try to do their business in a legitimate manner, I have no doubt they will do more than hold their own against electricity or any other competitor. I regard these competitors as advantageous. Hitherto, we have been under a system of protection. Now it has come to free trade; and we know that free trade develops the energies of those engaged in it. I feel the suggestion of Mr. Palmer, if it is assumed that the shareholders agree with it, may lead us into something that may be very unfortunate, because, so far as I can see, any electric light experiment we undertake will be carried on with the vast resources of the Company, and at the expense of the Company, and in fact at the expense of gas itself.

Mr. Palmer rose, and was understood to explain that he did not wish to cast any reflection on gas; but

The Chairman (interposing) said that no shareholder was allowed to speak twice. He continued: If no other gentleman is desirous of addressing the meeting I will reply. Mr. Palmer will see that it is hardly necessary for me to answer him. Mr. Livesey has already shown that the feeling which he seems to entertain, that we are to embark largely in electric lighting, is by no means shared by the proprietors, nor is it shared by the Board. The Board has had several applications before it for electric lighting. As I have said (and I do not think Mr. Palmer caught what I said), electric lighting might make considerable progress; but I also said that I did not consider great profit was to be made out of it at present, though, as it stimulates the use of gas, it is useful to us. Therefore, I thought, as Mr. Livesey has said, we can congratulate ourselves on having such a competitor. The reason we entered into the electric lighting at the Opera House and Theatre at Vienna has been so often explained to the proprietors by myself that it is hardly necessary for me to go over this very well-worn story. I am happy to be able to tell you we have applications for a further use of the electric light obtained from the station there; and consequently we shall be able to do more than light these two theatres. The lighting of the two theatres has been very satisfactory. The loss has been very small. We have had applications made to us by various electric lighting companies to allow them to co-operate with us in lighting or furnishing the electric light to some of our stations. We have not absolutely refused that co-operation. When the co-operation results in the use of other people's capital, we should assist our profit if it is possible to get it so assisted; but I think you will see that it is not necessary for us to go into general public electric lighting, unless there is some special reason, as there was at Vienna—a reason which, in my opinion (and, after all, that opinion is worth something, for I have had 21 years' experience here), was sufficient to induce us to do it in that one solitary instance. On the general principle, however, I entirely agree with the admirable observations of Mr. Livesey; and I am satisfied that the applications of gas are so numerous, the possibility of improvement is so great, and the capacity for giving increased lighting is still so large, that there is a great future for the gas lighting industry. And I may remind you that I several years ago pointed out to you what Sir William Siemens said to me himself. He said that he had been looked upon as an enemy to gas, but that he considered he was as great, or a greater friend to gas than to the electric light. He said to me on that occasion: "I have invested largely in gas shares at the time of the alarm on the subject of the electric light, because, from my knowledge, I knew that the fears on that subject were not well founded. I was satisfied that, just as with horses there was any amount of use notwithstanding the invention of railways, so for gas there was any amount of use notwithstanding the application of electricity." This being so, I can repeat again what I have often said before. You may be satisfied that in the shares of this Company you have a good property; and we should do our best to follow a conservative policy in this sense, that we should do all we can to preserve our business, and to adopt all the improvements that may be introduced in regard to gas. In answer to Mr. Weir's question, the additions to the Hanover works will cost between £30,000 and £40,000. They are being carried out under the advice and assistance of a most skilled Engineer, Mr. Corbet Woodall. I am sure these works will do credit to the Association and admirably accomplish the work thrown upon them.

The motion was carried unanimously.

The Chairman then moved—"That a dividend of 5 per cent. for the half year be declared on £3,800,000, stock of the Association, and the same be made payable, free of income-tax, on and after the 1st of June."

Mr. Wood seconded the motion, which was carried unanimously.

The Chairman: I said to you just now that I have been a Director of this Association for something over 21 years. Therefore, I am of age in your service; but my friend Mr. Wood has a much longer experience than I, and consequently it is with the greatest pleasure that I discharge the duty which now devolves upon me, of asking you to re-elect him as one of your Directors. He has done you good service in the past. His advice and abilities have always been of the greatest value to the Association; and I think there is no one in whom you ought to have more confidence than in Mr. Wood.

Mr. Rokeby Price seconded the motion, and it was carried unanimously.

Mr. Wood: I have to thank you very much for the renewed confidence you have shown in me. I have done my best; but the work has been a work of love.

On the motion of the Chairman, seconded by Mr. John Drew, Mr. J. H. Palmer was also re-elected a Director.

The Chairman then proposed the re-appointment of Mr. Backler. He said that Mr. Backler had been for many years associated with gas enterprise on the Continent. He was Chairman of two important Companies, and he knew that the shareholders in those Companies rightly placed in him the greatest confidence. He was also aware that his knowledge and experience were of great value to any Company with which he was connected; and all he could say was that when they appointed him they had great expectations of his capabilities, and those expectations had not been disappointed.

Mr. Livesey seconded the motion, which was carried unanimously.

On the motion of Mr. A. Cooper, seconded by Mr. Givens, Mr. Sebag Montefiore, the retiring Auditor, was also reappointed.

The Chairman intimated that the next business was the appointment of an Auditor in the place of the late Mr. Rowland Hill.

On the motion of Mr. Rokeby Price, seconded by Mr. Cuvelje, Mr. Montagu Somes Pilcher was elected to the vacancy.

Mr. Pilcher briefly acknowledged his re-election, promising to do his utmost to carry out the duties of the office.

Mr. Livesey: There is one important duty that we have to discharge; and I beg to propose a vote of thanks to the Chairman and his co-Directors for the admirable manner in which they have conducted the affairs of the Association during the past half year. I feel that, with such an able body of Directors, the shareholders may be perfectly certain that their interests will be satisfactorily attended to. What has been done in the past is an augury of what will be done in the future; and I am sure that I represent the feelings of the whole of the shareholders in proposing a hearty vote of thanks to the Chairman and his colleagues.

Mr. G. Barritt seconded the motion, which was carried unanimously.

The Chairman: I am very much obliged for the kind words which Mr. Livesey has used. The Directors, I think, have for many years shown a desire to serve the shareholders of this Association; and they have been encouraged and fortified by the constant confidence and support which the shareholders have always extended to them. I, for my part individually, have felt very much indeed the constant support I have received from all of you. I have frequently thought that perhaps the time was coming when it would be desirable that someone else should take my place; but when I have suggested this, both my colleagues and the shareholders seemed unwilling that this should be the case. Therefore, as long as I have health and strength to serve you, I shall do my best to do so; but I shall be quite ready to give way to a better man whenever you think the time has come to make a change. I now propose a vote of thanks to Mr. Lindon, who, I am sorry to say, is unwell, and to Mr. Drory, who is in excellent health, and to our able staff and representatives on the Continent. Mr. Gardiner and the members of the London office have also done their duty well; and I beg to move a hearty vote of thanks to all the staff.

Mr. Wood: I have the greatest pleasure in endorsing all that the Chairman has said in reference to the staff. I have known them during 30 years; and I do not think you could have a better body of men.

The motion was carried unanimously; and the proceedings then terminated.

Ulverston Local Board Gas Supply.—At a meeting of the Ulverston Local Board last Tuesday, it was resolved, after a long discussion, to reduce the price of gas from 3s. 9d. to 3s. 6d. per 1000 cubic feet, in addition to allowing a discount of 2½ per cent. to consumers of 20,000 feet and upwards; 5 per cent. to consumers of 40,000 feet and upwards; and 10 per cent. above that consumption. It was reported that the profits from gas and water for the past year amounted to £481; and it was resolved that £200 of this should be placed to the reserve fund account, and the balance carried to the credit of the general district rate.

BOMBAY GAS COMPANY, LIMITED.

The Ordinary Meeting of this Company was held last Wednesday at the London Offices, 6, Drapers Gardens, Throgmorton Avenue, E.C.—Mr. W. B. M. Lysley in the chair.

The Secretary (Mr. J. H. Perrins) having read the notice calling the meeting,

The Chairman said he was sorry to inform the shareholders that the onerous position of taking the chair had fallen upon him in consequence of the absence of the Chairman of the Company, Mr. Davidson, who was incapacitated by sudden sickness from attending the meeting. They would be glad to learn that his illness was not of a permanent character. He (Mr. Lysley) had only been asked a few minutes before the meeting to take the chair, and so he had only just had the figures relating to the past half year before him to look over. He supposed that they would as usual take the report and accounts as read (*ante*, p. 814). This having been agreed to, he moved—"That the report and statement of accounts be now received and adopted, and that a dividend for the half year ending the 31st of December, 1888, of 4 per cent., free of income-tax, be declared, to be payable on and after the 1st prox."

Mr. C. Gandon seconded the motion.

The Chairman said that, before putting the motion to the meeting, he had a few observations to make. As the shareholders would see by the accounts, there was an increase in the gas and meter rental of £607, as compared with the corresponding half year of 1887; and that with the residual products, the total increase amounted to £1782. There was an increase in the cost of the coal carbonized of £1569, which was accounted for in the first place by an additional consumption of 280 tons, and secondly, by the increase in the price of coal and of freights. They had shipped 3729 tons, at a cost of £1 19s. 6d. per ton, as against 3606 tons in the corresponding period of 1887, at the rate of £1 9s. 6d.; but, as they had a large stock in hand, the actual cost per ton amounted to £1 13s. 2d., as compared with £1 8s. 8d., so that the actual increased cost was only 4s. 6d. per ton. But as against the increased price of coal, it was right that he should inform the shareholders that they had been sending over to Bombay a much improved quality of coal—the best screened Silkstone, from which was obtained a much larger yield of gas of a higher illuminating power; and naturally the more coal they consumed, the more coke they obtained. There was an increase, as would be seen, in the purifying account of £196. But this was owing to shipments of oxide for the new purifiers; and they had now sufficient oxide to last them for several years. In the retort account there was an advance of £250; but they had rebuilt a whole stack of five settings, and had also put in 35 entirely new through retorts. In the rents, rates, and taxes, an increase was shown of £93. This arose, he might say entirely, from the resistance the Board offered to the increased assessment that was proposed to be made by the Municipality of Bombay upon the gas-works. Considering the assessment made was not justified, the Directors took measures to resist it, which were successful. It will be noticed that in reference to the four new purifiers, which, if he remembered rightly, were referred to at the last meeting, the cost had been written off entirely from the reserve fund, to which had been added £800 out of last half year's profit. During the six months under consideration they brought over £5000 at 1s. 4$\frac{1}{16}$d. per rupee; but in the current half year they had brought over £23,500 at the same rate. They had therefore got their money home this year at 1$\frac{1}{2}$ per cent. better than the previous year. The works and plant, he mentioned, were reported by the Manager to be in good order; and he proceeded to congratulate the shareholders upon the excellent position of the Company. They had, he stated, the old bugbear still to struggle against—the depreciation of silver. He did not presume to predict what its position would be in the future; nor did he fancy that anyone present would care to say. If anyone could tell them what it would come to, or go down to, then the Board could say what the future of the Company would be. When the exchange fell to 1s. 8d., there was a sort of terror or horror among the Directors of the Company (of which he had been one since its formation); and they were always thinking what they would do if the exchange went lower. He ventured to say they had a better balance-sheet this half year than they had had for many years past; and he regarded the position of the Company as a very good one. They could not make any promise as to what the dividend would be in the future. As the value of silver went up, so their position would improve. They had honestly earned the dividend they had hitherto paid; and his own opinion was they would be able to continue to pay at the same rate.

Mr. Beard observed that he had been a shareholder of the Company for a good many years; and he was glad to hear what the Chairman had said as to the future of the concern. He only wished that they could do something to get the price of silver to something like a figure that they could depend upon. If there was not this great loss on silver, there was no doubt that they would be able to pay 10 per cent. The remarks that fell from the Chairman twelve months ago were a little gloomy as to whether or not they would be able to maintain the dividend.

The Chairman said that, of course, the shareholders must take what he had said as being based entirely upon the present accounts.

Mr. Jackman inquired whether the Company had an exclusive monopoly of the lighting at Bombay. What was the concession?

Mr. Gandon replied that there was no concession. They had a local Act just in the same way as gas companies in England; and, of course, there was nothing to prevent the Government granting another if they pleased, as they could do here. It could scarcely be called an absolute monopoly; but practically it was so.

Mr. Beard: There is, I suppose, no fear of them granting a concession to another Company?

Mr. Gandon: Not the least.

Mr. Givens asked whether there was any idea of extending the operations of the Company, because Bombay was a very large place. Was the gas taken up by the native portion of the population?

The Chairman said he could only say that the Board used their very best endeavours, and the Manager took every possible step to increase the consumption, not only among the native population, but in the clubs, hotels, and so on. The best answer he could give was that during the past six months they had fixed 196 new meters; and the private consumption was still on the increase. They had also just received an order, by telegram, for six 80-light meters. There was no electric lighting in Bombay now; and they stood alone as public lighters.

Mr. Jackman remarked that if they could get an exclusive monopoly, they could shut out the electric light.

The Chairman said that they had had the electric light at Bombay. They (the Gas Company) simply remained quite quiet; and where the electric light was in use the fittings were taken down after a time, and the gas supply resumed. He did not think they could influence the Municipality to grant them a monopoly in lighting.

The motion was then carried unanimously.

Mr. Gandon proposed the re-election of Mr. Lysley, who was one of the Directors retiring by rotation. Having referred to the lively interest which that gentleman had always taken in the affairs of the Company, Mr. Gandon said he might perhaps briefly allude to the question of monopoly. He did not think that such a thing as a monopoly existed anywhere for gas lighting, because a monopoly for gas lighting would mean that people could not burn candles or oil. As far as his experience went, both in England and abroad, they had very little to fear from electric lighting. Their greatest antagonist or competitor was mineral oil, which was to be procured in Bombay as cheap as in England—that was, at something like 6d. or 8d. per gallon. He believed that oil at this price ran gas in England at 2s. 6d. per 1000 cubic feet very close; and if it would do that here, they might imagine what it would do in Bombay. It might appear strange that, with three-quarters of a million of inhabitants, so little gas was used. Bombay was larger than Liverpool; but the conditions of things were entirely different, and, at the price at which they were compelled to supply gas, it became a luxury—here, it was a necessity. And, again, the native population, which was very large, did not require artificial light as here. They went to bed with the birds, and rose with them; and so they did not need light. If they wanted light, all they used was a piece of cotton placed in a dish holding a little cocoanut oil. If they would not use gas, it was, he said, quite certain they would not recognize the electric light.

Mr. Stewart seconded the motion, which was agreed to.

Mr. Alfred Penny said it afforded him much pleasure to ask the shareholders to re-elect the gentleman they had just been listening to. Mr. Gandon, as they probably all knew, not only held the first rank as a Gas Engineer in England, but he had been in Bombay, and knew it thoroughly. He was conversant with every detail of gas manufacture; and having his services was a great advantage to the Company.

Mr. Flinders seconded the motion, which was unanimously carried.

The Chairman and Mr. Gandon briefly thanked the shareholders for re-electing them; the latter gentleman observing that if the value of silver would only go up again, they would be able, as Mr. Beard had said, to pay 10 per cent. dividend, and also be able to reduce the price of gas. Whenever they had been able to do so, they had lowered the price. The people did not seem to understand that the fall in silver was also equivalent to a substantial reduction in the price charged for gas.

Mr. Givens inquired what was the present price.

Mr. Gandon answered that it was 6 rupees per 1000 cubic feet to private consumers, and 5 rupees for the public lighting. With the rupee at 2s., this was equal to 12s. per 1000 feet; at 1s. 4d. it meant 8s.

Mr. Robert King was re-appointed an Auditor; and the election as an Auditor of Mr. E. A. Flinders was confirmed.

The usual complimentary votes were passed to the Board, the Engineer (Mr. Louis Penny), and the other officers of the Company.

The Secretary, in acknowledging the latter vote, stated that it was the good fortune of the Company to have as Manager a gentleman of exceptional ability to conduct its affairs at Bombay; and it was mainly to this the present prosperity of the Company was owing. It would be encouraging to the Manager to know that the proprietors appreciated his worth by the vote just passed, for which he (the Secretary) thanked them, as well as for including himself and the rest of the staff in the compliment.

INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

The Position of the Company—Dissatisfaction of Shareholders.

The Second Annual General Meeting of this Company was held last Thursday at the Cannon Street Hotel, E.C.—Sir Robert Daltell, K.C.I.E., C.S.I., L.L.D., the Deputy-Chairman, presiding.

The main points of the Directors' report are embraced in the remarks of the Chairman and the Managing-Director (Mr. J. Mactear, F.R.S.E., F.C.S.). The trading account showed an adverse balance of £5340; and the profit and loss account, a net loss of £13,604.

The Secretary (Mr. R. A. Cary) having read the notice convening the meeting,

The Chairman expressed his regret that on his first appearance before the shareholders, it should devolve upon him to ask them to pass a set of accounts which showed a considerable loss on the working of the year; and he then went on to explain how it was he occupied the prominent position that day of Chairman, being the junior Director. When he joined the Board in January last, his old friend Sir Andrew Clarke desired to be relieved of the duties of Deputy-Chairman, in consequence of his numerous engagements; and he (Sir Robert) was elected to the position. The Chairman (Mr. Wollaston Blake) also resigned his seat at the Board, owing to his many engagements in the City, and finding it inconvenient to attend to the duties of Chairman at the offices in Victoria Street, Westminster. Turning to the report, he said that the loss was due entirely to the failure and the inferior quality of the fluid that was sent from Vienna, in the early part of last year. The amount of compensation they had received in the shape of a reduction of the claim of the vendor upon the Company by more than £200,000, while a very substantial amount, was by no means an excessive compensation for the serious loss they had incurred. Since he had been connected with the Board he had carefully investigated the previous history, the present position, and the future prospects of the Company, and he really could hardly believe it possible that a business which promised to be such a wonderful success as this did when it was started, could have been so shattered by the failure of the lights, through the defective supply of fluid from Vienna. When they remembered that in the early days the sales of the lamps actually reached the unprecedented number of 700 in a day, and that during last year there were very few weeks in which this number was sold, and only one week in which it was exceeded, they would understand what a serious loss the Company had sustained. He did not think, however, that there was any need for the shareholders to be too despondent as to the future. In his opinion, they had a very excellent light now; and, as the Technical-Director would shortly explain, in all material respects it was quite equal, if not superior, to the lights first issued. If the merits of the light became more generally known, he felt sure the Company would be a great success. Were the Company in possession of a large amount of unexpended capital, he should strongly recommend a considerable outlay upon advertising; but, under existing circumstances, he could only urge everyone of the shareholders to make the light generally known. If their 450 shareholders would each obtain a dozen customers, they would soon be able to turn the loss into a profit. He then asked Mr. Mactear to address the meeting; and to that gentleman, he said, they were much indebted for his exertions on behalf of the Company.

Mr. Mactear, who spoke at some length, referred to the loss on the past year's operations, and said the shareholders, who were not as it were behind the scenes, did not come in contact with the difficulties they had had to contend with. It was only in September last they were actually in a position to go into the market and supply lamps that they knew would be of the quality they originally began the business with. Since that time the results of the trading had been considerably better; they had been improving very steadily, and gave sufficient hope for the future. He alluded to what he termed the "considerable" and "grave" disadvantages of the form of lamp they first supplied; one of the "disadvantages" being the difficulty of obtaining a renewal without returning the whole lamp. This had been overcome; and mantles were now supplied fixed to a small

fitting, which simply had to be placed over the burner of the lamp. The lamps had been greatly improved in various ways; and, as far as his tests went, were superior to any of the lamps he had yet tried. The lamp was very much lower, the burner was lower, and it had at the upper part a small portion of steatite, which helped to increase the light, and kept the fittings cool. He mentioned some tests they had made with this improved form, which showed that the lamp lost comparatively little light over a period of 1000 hours. They had also cases where lamps in actual use had been burning above 1000 hours, and still gave a good light; and one had been burning 6000 hours. Having stated that he looked forward to the results of this year being very different to those of the past, he referred to the Company's operations in Paris, where good progress was being made. They had succeeded in getting an excellent position in the Exhibition; and they were lighting up a portion of the great exhibit of the combined Gas Companies. Their late Vice-Chairman Sir Andrew Clarke, who was now in Paris, wrote a glowing account of the appearance of the lights in the cafés where they were in use. He assured the shareholders that they had now sufficient material on their premises to supply any demand for the lamps that might be made upon them for between three and four years. In future the material would be cheaper; and they would be able to reduce the price of the light very considerably without affecting, in his opinion, the position of the Company. The weak spot in their position was the difficulty of selling the lamps. They could manufacture any number; but the troubles of last year caused a lull in the sale which they had not yet recovered. The results of some tests made on the lamps, in comparison with Argand and batswing burners, by Dr. C. Angenot, of Antwerp, were quoted by Mr. Mactear, who then made an extended reference to the position of the Company's capital. They had obtained a very large reduction, he said, in the purchase price of the patents; but even with this reduction, which practically made the capital £200,000, they had now standing against the patent account a sum of £156,000 for the whole of the foreign patents they possessed and for the English patent. He thought the shareholders would agree with him that it would be an exceedingly false principle to go upon that this sum should be kept standing from year to year without being depreciated, because, at the end of the life of the patents, they would still have standing against them as their value this sum of £156,000. Practically the patents at the end of that period would be of no value at all, though the Company would certainly have the goodwill of the business. Now if they wrote them off, as judicious business men ought to do, it would require a sum of about £12,000 a year to be placed against the profit and loss of the Company before a divisible profit could be obtained. His proposal was that they should take the step of writing off these patents very largely now from the capital account, raise the value of the shares, and so bring the capital down to £100,000, or one-fifth of the nominal capital of the Company, and leave standing as the value of the patents from £10,000 to £20,000, which would be considerably recouped by the sales of the foreign patents they proposed to make. They would then be in a position, when they sold the foreign patents, to distribute the proceeds of the sale as dividends or bonuses, either in the form of cash or in the issue of bonus shares. This was a matter they could not decide that day; it was a serious matter, and should be decided at a special meeting. As far as he was concerned, unless something was done, he must decline to take any further part in the work of the Board. He felt the absurdity of going on with their capital as if they possessed an asset of £156,000 in value until the end of the life of the patents. They had to face the fact that shortly they would require some more capital; but with the present unfortunate balance-sheet, it would be impossible to place capital at anything like the price of the shares at £5 each; and they could not place shares at a discount by reason of a recent decision. If they carried out his proposal, he thought there was a probability of reaping a profit, and of being able to place some further capital.

Mr. ELKAN said that the original prospectus stated that the Company had entered into agreements to sell the patent rights for France, Belgium, Spain, and Portugal, and that in each case they had received a forfeiture cash deposit. What, he asked, was the amount of the forfeiture in each instance, and why was only one case mentioned in the accounts—that of France.

Mr. MACTEAR replied that the sale to France was made before the prospectus was issued; and the deposit paid in connection with this patent was £5000. The patents for Belgium, Spain, and Portugal were sold after the prospectus was published; and the deposit there was £2500. In those cases the purchase was made on the statements in the prospectus. When they found they had got into a difficulty in regard to the fluid, they saw that they would either have to abandon the forfeitures in these three cases, and cancel the contract, or face a heavy lawsuit. As regards France, they had entered into an agreement by which they had arranged to sell upon new terms; and, in the meantime, they were selling lamps there under a royalty. Replying to another question, he said that really the vendors had returned them nothing; but what the Board had done was to agree with the vendors that they should not be liable to pay them a very much larger further sum.

Mr. ELKAN, in the course of further remarks, expressed the opinion that the prospectus was very deceiving. He considered the working expenses were excessive; and thought that, when a business of this description yielded no profit, great blame attached to the Directors.

Mr. MACTEAR remarked that, before a statement of that nature was made, it was due to the Directors that the matter should be investigated. Speaking of the working expenses, they manufactured last year 49,373 more lamps than were made in the previous year; but a large number of these lamps were required to keep up installations that were in use, and were actually unremunerative.

Mr. MORRICE thought that, considering the unsatisfactory state of things, the meeting should be adjourned, and a Committee of shareholders elected to go thoroughly into the affairs of the Company, and to report to the shareholders. He intimated that there were many points that required investigating—prominent among them being the price of the lamp, which should be reduced. The price, he remarked, was 15s., of which 2s. was for the mantle, and 13s. for about a shilling's worth of brass. The mantle was their patent; and on that they ought to make their money. In the balance-sheet there were calls in arrear, of £5283; and these shares he considered ought to be forfeited. He concluded by proposing that the meeting be adjourned, and that a Committee of shareholders be formed for the purpose he had named.

Mr. FAULKNER seconded the proposal.

The CHAIRMAN stated in regard to the calls in arrear that these had nearly all been paid since the beginning of the current year. He pointed out that the Directors were large shareholders, and that they did not fear a full investigation.

Mr. WILLIAMS (who was one of the vendors) thought it curious that at Vienna they had not suffered in the least in regard to the fluid; and there they had the most perfect installations of the light.

The discussion was continued by several other shareholders, all of whom appeared to be in favour of the suggested Committee; and subsequently Mr. Morrice's motion was agreed to. Five gentlemen were then appointed a Committee, and were empowered to make a full investigation into the affairs of the Company, their report to be presented at a meeting of the shareholders on the 6th prox., or such other day as may be determined by the Directors.

The proceedings then terminated.

WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Assembly of this Company was held last Tuesday at the Offices, Marylebone Road, N.W.—Sir W. H. WYATT in the chair.

The CHIEF CLERK and SECRETARY (Mr. G. B. Hall) read the notice convening the meeting, and also the Company's Auditors' report, which stated that the gross rental for the half year ended Lady-day last had been £109,020, or £693 in excess of the amount received in the corresponding period of the previous year. The report of the Directors and the statement of accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, expressed the deep regret of the Directors at the death of their old friend and colleague Major Charles Lestock Boileau. For 40 years the deceased gentleman was a Director of the Company; and for more than 30 years, he filled the position of Chairman. Major Boileau had devoted the very best period of his life and his best energies to promoting the welfare of the Company; and there was no doubt that it was largely due to Major Boileau and those who had acted with him, that the concern was in its present prosperous condition. In the last few years of his life, infirmity prevented Major Boileau from taking any active part in the Company's affairs; but he (the Chairman) was sure their late colleague had retained the same lively interest as ever in the welfare of the undertaking. At a later stage of the meeting the proprietors would have to elect a Director to fill the vacancy caused by Major Boileau's death. Turning to the report, the Chairman observed that it dealt with every subject in which the proprietors took an interest. They had entered into a contract with Messrs. John Aird and Sons for the construction of a reservoir at Willesden, capable of holding 2½ million gallons of water. They had done so with some anxiety, because in the present harassing state of things, with the new body which had lately come into power, which was anxious to monopolize everything and everybody, the proprietors might think that the Directors ought not to have decided to spend such a large sum as the work would involve—£25,000. The Directors, however, thought it was wise to do everything in their power to keep up the general efficiency of the undertaking; and if it should be bought up some years hence—he did not think it would be immediately—they relied upon obtaining a fair price for it, if they maintained the works in a thorough state of efficiency, and served the public well. They did not wish to sell the undertaking—they would, indeed, prefer to keep it, for it was a valuable concern, and it was very difficult now to re-invest money. But at the same time if they were obliged to sell it, the Directors would do all they could to get a fair and just price for the undertaking. He was afraid that in the next two or three years a good deal of trouble would be entailed, and great care would be required to be exercised; but the Board would do all in their power to protect the interests of the proprietors. They were putting up a new Worthington engine at Hammersmith in place of two engines which were being taken down—they being respectively erected in 1810 and 1814. Of course, engines had since then been very much improved; and the engine which they were now erecting would do much more work than the two present ones, and the saving of coal which would be effected by the change would very nearly, if not quite, pay the interest on the cost of the new work. In the last three years, since they had been able to allow a certain rate of discount to the consumers, they had at Christmas given a gratuity of 5 per cent. to all the officers in the Company's service. They did not give the workmen 5 per cent., but a sum of £3; but this reward was lost if a single well founded complaint was made. Only two of their men had lost it—a fact which he thought was very satisfactory, as showing the good character of their workmen generally. Last half year the Directors reported that they had a friendly dispute with Mr. Stoneham, the Official Auditor, as to whether or not a certain payment made by the Company to the Thames Conservancy was legal. Mr. Stoneham thought it was not; and the matter was referred to the arbitration of Sir Henry James, Q.C., M.P., who had decided in favour of the Company. This difficulty had, therefore, been removed.

The DEPUTY-CHAIRMAN (Mr. J. Meyer) seconded the motion, which was carried unanimously.

The CHAIRMAN then proposed a dividend for the half year ended March last at the rate of 10 per cent. per annum on the consolidated stock, payable, less income-tax, on and after the 5th of July.

The DEPUTY-CHAIRMAN seconded the resolution, which was carried unanimously.

Mr. J. B. PADDON then proposed a resolution increasing the remuneration of the Directors by £600 a year. He referred in warm terms to the services of the Board, and spoke of the increased responsibilities which were cast upon them by the extension of the Company's business.

Mr. BICKERSTAFF seconded the motion, which was carried unanimously.

The CHAIRMAN, in reply, said that the Directors appreciated the resolution quite as much as a mark of confidence as a money gratification. He could not promise that the Directors would do more for the proprietors; for he really believed they had done all in their power to promote the welfare of the Company. He could, however, certainly promise that they would not do less.

On the motion of the Rev. C. F. CASS, seconded by Mr. EWART, the retiring Directors—Mr. J. Pomeroy, the Hon. Baron Dimsdale, M.P., Mr. H. W. Prescott, and Mr. E. Cumberlege were re-elected; as was also Mr. H. R. Solly, the retiring Auditor, on the motion of Mr. MAIR.

The CHAIRMAN then intimated that the meeting had next to proceed with the election of two other Auditors.

Mr. ROKEBY PRICE proposed the appointment of Mr. C. Dimsdale; Mr. BAXTER nominated Mr. B. M. Smith; and Sir. R. H. WYATT proposed Mr. G. Pitt.

On a show of hands being taken, the numbers were declared to be in favour of Messrs. Dimsdale and Pitt; and Mr. Smith not demanding a ballot (in order to save the meeting trouble), the two gentlemen named were declared duly elected.

Votes of thanks having been passed to the Directors and Auditors,

The meeting was made special for the election of a Director in the room of the late Major Boileau.

Mr. PADDON proposed, and Mr. DOE seconded, the election of Mr. E. Homan; and Mr. WINTON proposed, and the Rev. C. F. CASS seconded, the appointment of Mr. A. M. Mackinnon (late Auditor of the Company).

The CHAIRMAN stated that the mode or ascertaining the proprietors' wishes as to the election of a Director, where there was a contest, had to be settled by the ballot; and the votes would be taken for two hours.

The poll resulted in the election of Mr. Mackinnon.

THE Directors of the Tuscan Gas Company, Limited, have declared an interim dividend for the six months ended March 31 at the rate of 8 per cent. per annum.

COMBINATION AMONG GAS WORKMEN.

Within the last few weeks an organization has sprung into existence bearing the comprehensive title of "The Amalgamated Society of Gas Workers and General Labourers of Great Britain and Ireland;" and numerically it has already assumed vast proportions. The objects of the new institution are primarily to get an "eight-hour day" established among gas stokers, who at present work twelve-hour shifts, thirteen shifts in the fortnight, and to put a stop to overtime, which the members propose to do by refusing to work extra hours for less than time-and-a-half, or, in other words, 50 per cent. higher than their fixed rate of wage; and for Sunday work they insist upon being paid "double time." The men, it is asserted, do not desire less labour during the hours they are at work. "At the present time," quoting the words of one of the Society men, "we have to 'do' 90 retorts in a day; and we only ask for such a reduction in the number as will enable us to do the work in eight hours." Asked whether they had always had this amount of work to perform, the same man replied: "We do not have to charge a larger number of retorts now than in days gone by; but we have to lift heavier weights of coal each charge." The men appear to be very sanguine over the success of their movement, and believe they will ultimately attain the desired objects by combination and legitimate agitation. As far as numbers go, the new institution bids fair to be prosperous. Already, we are informed, more than 3000 London gas men have joined the organization, the entrance fee to which is 1s., and the contribution, 2d. per week.

On Sunday morning a "mass" meeting was held on some waste land in the Barking Road, under the auspices of the new Society. A procession, consisting of at least two dozen brakes' full of men, and large numbers following on foot, with banners and bands, started from the Canning Town Railway Station and proceeded to the meeting-place, where they were joined by contingents from other directions. It was computed that there were not less than 5000 men present, including representatives from the following works:—Beckton, Nine Elms, Canning Town, Fulham, Kensal Green, King's Cross, Greenwich, Old Kent Road, Vauxhall, Rotherhithe, Bromley, Stepney, and West Ham. The meeting was first addressed by Mr. W. Thorne, who was Chairman, and who referred at the outset to a petition that had been sent to Mr. Beale, the Superintendent of the Beckton Works, and to two interviews the men had had with him on the question of the number of retorts they were to draw in a day. It appeared that this petition defined 84 as the number of retorts that was to constitute the day's work. At the interview, Mr. Beale said that he understood the intention of the men was, after they had done the 84 retorts each day, to lay down their tools and go home; and he inquired if they were willing to agree among themselves to do three extra draws on a Sunday morning until such time as they obtained an answer to the petition. The first question they had to decide that day, said Mr. Thorne, was whether they would do these extra draws on Sunday morning without double time. He asked for a show of hands of those who would not undertake this additional work without double pay; and nearly all present held up their hands. Amid much laughter, the Chairman then requested those who were disposed to do the extra draws without further pay to indicate it in a like way; but there was no response. Mr. Thorne went on to say that they were justified in asking for the double time. They left their homes on a Sunday evening, and did not arrive there again until 6.30 on Monday morning, and had to continue this the whole seven nights in the week. Then on the following Sunday morning, after they were quite exhausted, they were asked to do three more draws, without double time. This he characterized as "ridiculous," and said it would bring the men to a premature grave. They were told, he said, that things had gone on very smoothly until this organization was started; but he strongly denied this, and said there had been "grumblings" among the men for a long period, but they had never until now been able to state their grievances, because it meant instant dismissal. The men now knew their power; and they meant to get back some of the privileges of which they had been robbed year after year. Mr. Beale had told them that this new organization would only last two months; and that there would soon be a split in the camp; but if he had been present at that meeting he would have seen more solidity among the working men than he had ever seen before. The workmen had got the key of the box from which the shareholders took their dividends; and if they kept a firm hold of that key, the shareholders would not be able to dip their hands into that box until the men had obtained what they required. Mr. Beale had asked them how long they would be satisfied if they got what they now desired. He (the speaker) replied that it might be months, or it might be years. But he might say that when they knew that they had a power behind them they would go in for 1s. a day rise.

Mr. W. Hobart then moved the first resolution—"That in the opinion of this mass meeting of gas workers, eight hours shall constitute a working day; and we call upon all gas workers to combine together to bring the same into effect, with a reduction of the work to correspond." Speaking of the last few words in the resolution, he said it would be utterly impossible for stokers to do the work of twelve hours in the retort-house in eight, so that the present amount would have to be curtailed. He dilated upon the arduous nature of the work, and of the constant strain upon the physical powers of the men. Besides giving them the opportunity of recruiting their strength, the reduction in the hours of labour would give work to numbers of their fellows who were now out of employment. He urged the men not to admit "doubtful characters" into their Society, because societies of a like nature to this had been wrecked in times past by "interested men," who came to them as friends, but were really enemies. The motion was seconded by Mr. T. Mann, who said that, in his judgment, eight hours' work was as much as any man should be called upon to do—gas stokers especially. He believed that in starting this organization, they were setting a "shining example" to every other class of workmen in the country. If they stuck to the first item in their programme, and insisted upon a working day of eight hours, and not less pay by even a halfpenny, in a measurable distance of time stokers at Beckton and at every works in the Metropolis would gain their point, and the provinces, he was sure, would soon follow. He thought they should not merely be content with seven days of eight hours per week, but should aim at six days, and perhaps by-and-by five days, of eight hours, which would be ample for any man employed in stokers' work. It was almost certain, he went on to say, that Mr. Beale and the other officers and Directors of the various Companies would endeavour to buy some of the men over; but if the men took so fatal a step, they would soon be driven back to the position they were in before. Their object was not to create strikes, but to prevent them. Before concluding, he said that Mr. Cuninghame Graham had asked him to state that a prior engagement prevented him attending the meeting; but if he was invited to one of their future gatherings, he would certainly make a point of being present. Mr. H. Howard briefly supported the resolution, and was followed by Mr. B. Tillett, who caused some amusement in pointing out that the general order of things had been somewhat reversed in gas-works—in this, that the scoops and shovels instead of getting smaller in use seemed, as time went on, to increase in size; this statement being greeted with cries of "Quite right." More gas and coke and less clinkers were now being produced from the coal; and where five men used to be employed to do the coke "business," there were only three men now, and less men were engaged outside the real retort-house work than formerly. More profit was going into the pockets of the non-workers; while the workers were being "sweated." Was it not, he asked, right that the workers should have some share in the improvement that was going on? The people who wanted the stokers to continue at their work for twelve hours a day should try it for that length of time themselves, and see what it was like. He urged all who had joined the organization to stand "shoulder to shoulder." The resolution was carried amidst loud cheering.

Mr. J. Walsh regretted that there should be any necessity for him to move the next resolution, which was as follows:—"That in the opinion of this meeting, the action of the [Gaslight and Coke] Company's agents in wrongly discharging some of the Society's men is mean, unjust, and dangerous; and we call upon all gas workers to contribute to the fund for their maintenance." In the course of his remarks, Mr. Walsh suggested a fresh means of disposing of a portion of the money which would accrue to the Gas Companies on the lapse of the coal dues. As, he said, all those present were probably aware, the coal dues were about to be abolished; and this would give the Company something like £100,000 a year. Now, Mr. George Livesey formed one of a deputation to Mr. W. H. Smith, the Leader of the House of Commons, and told him that this money would be given away to the consumers by reducing the price of gas, or would be used in some other way. It was, said Mr. Walsh, for the gas stokers to demand their "proportionate share" of these coal dues. Did the Companies expect them to go on for ever as they were now? Mr. Beale threatened them with the jail as conspirators; but he (the speaker) would rather go to jail than go down to Beckton that night, and perform an almost Herculean task. But with regard to the word "dangerous" in the resolution, it was, he maintained, "dangerous" to discharge those men, because it was only provoking the other men at the works. But whenever they saw a man discharged, he would ask the members of the Society to keep themselves sober-minded, and to go on and work as usual. Let them continue to have meetings like the present to protest against these things, and obtain money to support the men who might be discharged. A strike would be a last resource; and they would do nothing until they were prepared. He implored them all to protest against the meanness of the great and powerful Company in discharging the leaders of this movement for trying to obtain their just rights. Mr. J. Franks seconded the resolution; and expressed the pleasure it gave him to be present at the meeting to speak against the conduct of the "tyrannical" Company. He proceeded to explain why the two men were "illegally" discharged. They were, he said, dismissed for refusing to do a task that it was impossible to perform. The foreman went to them and said: "I want two scoops and twelve shovelfuls of coal put into each of four retorts." Was there any man at Beckton, or anywhere else, who could do this? (Cries of "No, no.") These two men refused. They were discharged; and they had now placed the matter in the hands of a solicitor, and were considering whether they should not prosecute the Company for illegal dismissal. He went on to assert that this was not the real cause of their discharge. It was because these men refused to pay what was known as "pepper-and-salt" money—that was, the penny a week which each man paid to the foreman. Was that justice or not? Pointing out that if the men refused to do their work, they were liable to six weeks' imprisonment, he asked why these two men were not locked up, and why all the men on the works were not dismissed. As a purifier man, he requested all who were engaged in the same work as himself to join the Society. Mr. Watkinson also briefly addressed the large assemblage; and the resolution was unanimously carried. The Chairman then declared the proceedings closed; and after an enthusiastic round of cheering for the speakers, the men dispersed.

Another meeting was held in the afternoon, at Kensal Green; and it is intended during the next few weeks to convene meetings in other parts of the Metropolis, the proceedings at which, we understand, will be of a similar character to those of last Sunday.

Last Thursday, a public meeting was held in Bristol, for the purpose of organizing a trades union amongst the workmen employed by the Bristol Gas Company. It appears that the movement on the part of the men was prompted by a proposal of the Directors by which, as alleged, the workmen would be deprived of three days' wages. Mr. R. G. Tovey presided, and, in opening the proceedings, said the object of the meeting was to form a combination amongst them to protect their interests and to secure honourable conditions of labour. He did not wish to dilate upon their grievances, but he would express his hearty sympathy with the men, believing that they had good cause to complain of the conditions which were intended to be imposed upon them. When they had secretaries and managers whose object was to increase dividends, the men did not get any sympathy, and had to work very hard so that higher dividends might be paid. He was convinced that by their united action they would be able to obtain better wages for the benefit of their wives and families, and secure more honourable conditions of labour. The following resolution was then moved:—"That this largely attended meeting of the *employés* of the Bristol Gas Company utters its protest against the over-bearing and unjust attempt of the Directors to keep back a portion of their wages, thereby depriving their wives and families of their means of subsistence, especially seeing that nothing of the sort has ever been attempted for the past 40 years." Several workmen spoke in support of the resolution; one stating that old rules were being changed at the works, not for the purpose of benefiting the men, but for getting the work done at less cost. Their labour was worth more than 30s. per week. Mr. H. H. Gore also spoke in support of the resolution, remarking that he thought that if some of the Directors of the Company knew how the men worked, and the conditions under which they lived, they would be satisfied with a lower dividend. The motion was then put and adopted. Another resolution was submitted and carried as follows:—"That we, the *employés* of the Bristol Gas Company, seeing that we are likely to be subjected to such treatment as is altogether inconsistent with common justice, resolve that we take such legitimate means for our future welfare as we may think necessary." A third resolution was passed, by which those present pledged themselves to join a union, to be called the "Bristol United Gaslight Company's Labour Union;" and subsequently about 200 men enrolled themselves as members.

Last Sunday week, a largely-attended meeting was held of workmen employed in the Birmingham Corporation Gas Department. Mr. Bloor (who, it will be remembered, in conjunction with Mr. Granger, brought forward, at a recent meeting of the Town Council, the question of the position of the men at the Saltley Gas-Works) presided. It was unanimously resolved to form a trade society in connection with the gas-works; and eight men (two from each of the four works), together with Messrs. Granger and Bloor, were appointed a Committee to formulate rules, which are to be submitted to a future meeting. It was fully recognized by all the speakers that the members of the Gas Committee desired to do justice to the men

in their employ; but it was urged that, up till a recent date, the understanding had been that a grievance-maker was certain to be dismissed. Now that the Committee had announced their willingness to communicate with the workmen when asked, and had practically carried this into effect, it was thought desirable to organize a society of the men, with a small subscription, so that representations might be officially made and frivolous complaints prevented.

LINCOLN CORPORATION GAS SUPPLY.

The Past Year's Working—Reduction in Price.

At the Monthly Meeting of the Lincoln Town Council on Tuesday—the Mayor (Mr. W. Watkins) presiding—the report presented by the Gas Committee included a recommendation that the price of gas should be reduced to 2s. 6d. per 1000 cubic feet as from the 24th prox., and also that the sum of £10,000 (a portion o fthe balance standing to the credit of the gas-works revenue account) be carried to a reserve fund, to be created under section 61 of the Lincoln Corporation Gas Purchase Act, 1885.

Mr. Page, in moving that the minutes be approved, said the members of the Council would be glad to learn that, subject to audit, the profits of the Gas Department during the past year had been good—amounting to £3975. This profit was applied, according to the Act of Parliament, first of all to paying instalments on the sinking fund, which absorbed a sum of £1640, leaving the net amount to be dealt with £2335. Wherever there was a surplus, there was generally an outlet; and when they came to consider what was the best mode of dealing with the surplus, they were reminded that no less a sum than £1500 would be required to pay the interest on what they had to give in connection with the stock by way of bonus, to enable the stock to be taken up profitably. But it must be borne in mind that this £1500 would enable them to effect a saving of interest of something like £1000 a year. A surplus of £800 was then left to start the year with, which he regarded as very satisfactory. In addition to this, the Committee had entered into profitable contracts for a large portion of the coal supplies; two-thirds of the quantity having been secured at the pre-existing low prices, which would carry them on to July, 1890. Under all these circumstances, the Committee felt perfectly justified in taking a step which would reduce the income of the Gas Department somewhat—a step which they had no hesitation in taking, and which they believed they would be able to maintain thereafter. So far as the capital account was concerned, it remained pretty much the same as four years ago, when the Corporation acquired the undertaking. It stood at £190,417, of which the Corporation had only expended £911; and, therefore, while they were able to make these profitable returns, they were not doing it at the expense of charging a large amount to capital. It was satisfactory to know that the revenue account, which, at the time the Corporation took over the concern, had a credit of about £9000, now stood at £13,000. Taking all the figures together, during the four years the Corporation had been in possession of the works, the profit which had accrued to them was £13,388. But one, he said, must never, of course, forget that, even if the undertaking had remained in the hands of the shareholders, some portion would have been applicable to the benefit of the gas consumer. In dealing with this profit, they ought so to arrange matters that, not only the ratepayer should gain, but that the gas consumer should get some advantage. He thought they had arrived at a situation when the consumers were going to derive some benefit. They had already reduced the meter-rents by one-half; and now the Committee were able to lower the price of gas. At one time he believed that the only persons to be considered were the ratepayers who owned the undertaking, and the consumers by whom they were enabled to make a profit; but since they had been connected with the gas-works, they thought there was a third creditor on the scene, and that was an impersonal creditor—the gas itself. While, therefore, they were making a profit, they should spend a portion of that profit in still further improving the quality and purity of the gas. Complaints very seldom reached the Committee as to the quality of the gas; and their tests, both as regarded the purity of the gas and the illuminating power, were entirely satisfactory. Some two years ago, for the purpose of increasing the consumption of gas, the Committee embarked upon the supply of gas cooking-stoves. The result of that experiment had been completely satisfactory; and at the present moment there were nearly 300 cookers in use, and scarcely one was ever returned. It was partly with the view of still further augmenting the use of stoves in the summer months that the Committee were making the present reduction in the price of gas. They thought that, by meeting the consumer in the price and quality of the article they supplied, they were doing everything that could reasonably be asked of them, as well as securing a profit. The Corporation at the present time, by the operation of the sinking fund, had put nearly £7000 in the concern, in addition to increasing the revenue.

Alderman Maltby expressed his pleasure in seconding the adoption of the minutes, first because the result reflected credit on the careful way in which the Committee had managed the undertaking, and, secondly, because it might be in the recollection of many of the members that he took the initiative in suggesting that the gas undertaking should be purchased by the Corporation. At that time he made certain statements which he then believed would be fully verified, and which he could now say had been more than realized—in fact, they had nearly been benefited to double the extent he predicted.

Mr. Cannon considered the report they had heard was very satisfactory, as it proved that a liberal and spirited policy in the management of the works had borne the fruit anticipated. He hoped the Committee would continue in the course they were pursuing in endeavouring to supply the very best possible gas, and that they would reduce the price again when the time came.

The Mayor remarked that Mr. Page had not said anything with regard to the creation of the reserve fund.

Mr. Page said they had a sum of £13,000 to the credit of the revenue account; and according to the provisions of the Act of Parliament, after they had provided for eight other things, the ninth was to form a reserve fund and invest it. The Committee, instead of leaving £13,000 to the credit of revenue, proposed to set aside £10,000 of that amount, as a nucleus of a reserve fund. At present it was used as floating capital in the business. As cash accumulated, it would be invested.

Mr. Martin observed that, where they had an undertaking which cost £191,000, they ought to have a reserve fund, in case of any unexpected great loss.

The minutes were confirmed.

The Vyrnwy Reservoir.—At the meeting yesterday week of the Vyrnwy Works Committee of the Liverpool City Council, the Engineer, Mr. G. F. Deacon, reported that Lake Vyrnwy now contained 8800 million gallons of water. There had not been so heavy a rainfall during April as it was expected there would be, judging by the records of previous years; consequently the water in the lake had not risen rapidly. Still there had been a gradual and satisfactory flow of water into the reservoir.

ROCHDALE CORPORATION GAS AND WATER SUPPLY.

Annual Financial Statement.

The abstract of accounts of the borough of Rochdale has lately been published. As has been already stated in the Journal (*ante*, p. 817), the net profits of the Gas Department for the past year amounted to the sum of £12,962. In the previous year, they were £15,503; and the year before that £12,128. It is to be remembered, however, that during nine of the past twelve months, the price of gas has been 3d. per 1000 cubic feet, and for three months 6d., less than it was in the preceding year. As a reduction of a penny in the price means more than £1000 on the year, the profit of £12,962 really represents a better result than the larger profit of the year before. A higher price has been obtained for the residual products, which has had much to do with the improved profits. Of course, the reductions in the price which have taken place render comparison with last year's figures (so far as the sale of gas is concerned) more difficult than usual. In the year just closed the net gas-rental amounted to £39,753; the year before, it was £42,850. The receipts from the residual products, which in 1887-8 were £12,445, increased last year to £13,873. Turning to the other side of the account, the coal used has cost £15,418. The wages have advanced slightly compared with the previous year; but there is remarkably little variation in the different items of working expenditure for the two years, except that, in the twelve months just ended, there has been an exceptional amount spent in the renewal of the sulphate plant. This work has cost £1024 in all, to pay which £500 has been taken from the reserve fund; and the balance debited to the revenue account. It is noticeable that, while the manufacture of sulphate in 1887-8 cost £1433, in the year just closed the expenses were only £1307. In pursuance of their policy not to increase the capital account, the Committee are gradually building up a reserve fund, from which to draw for future extensions. They devoted the sum of £1500 to that fund this year; and it now amounts to £4248. This, of course, is in addition to the annual payment into the sinking fund of the amount, which in the statutory time, will be sufficient to pay off all the loan capital. In regard to the water-works accounts, the loss has been £12,732. Two years ago the loss on the department was £14,507. Then came the exceptionally dry weather of 1887, when the stored water was laid under contribution, not only by the Heywood Corporation, but by many private firms; and the extra receipts from these sources increased the gross revenue more than £1700, and reduced the loss on the year to £12,841. Last year was not a very dry one, but the exceptional result of the previous year was maintained, and the net loss is £100 less than the year before. The ordinary water-rental has increased from £20,819 to £21,283; but the receipts from water by meter have diminished from £4547 to £3448, and the extra water supplies from £837 to £313. On the other side of the account, the favourable result is helped by the reduced rate of interest now payable on the loans of the department, and the lessened amount due for rates and taxes. It is to be noted, however, that there is a substantial decrease under the head of repairs to works, &c., and miscellaneous charges.

In the course of a statement on the Corporation accounts at the meeting of the Town Council last Thursday week, Alderman Baron remarked that the surplus on the gas-works fund was more than £2500 less than it was last year. The income from residuals had increased; but there had been an extra charge for renewal of sulphate plant. After charging £500 of this to the reserve fund, there was £524 charged upon the year's revenue. The works had been depreciated to the extent of £61,540; and the reserve fund had reached the satisfactory total of £4249. The water-works fund was slowly but surely getting into a more satisfactory state; and he thought that they might confidently rely upon further improvement. Alderman Petrie observed that Mr. Baron was not quite accurate in his references to the Gas Department. It was twelve months since the first 3d. was taken off the price of gas; and this reduced the revenue by £3000. For the last three months, a second reduction of 3d. had been in operation. The reduction in the total profits was only £2500, or £500 less than the estimate. Alderman Littlewood said there was a total profit on the gas-works of £20,000, or 11¼ per cent. on the capital of £178,000. If they were to go to Parliament now, they would not be allowed to make that amount of profit. There was one thing the Committee ought to do, and that was to charge more liberally for depreciation. It might be said, and with truth, that the working plant was renewed annually out of the revenue; but this did not apply to buildings. There were several reasons why more liberal depreciation should be allowed. In these days gas had several powerful competitors. The use of the electric light was being rapidly extended. It was so superior in many respects to gas that some people did not mind paying the increased cost; and it was not at all improbable that the price might be reduced. There was also the new water gas. Looking to these and other competitors which might appear, it seemed to him that the gas plant was in very considerable danger; and he thought it would be a wise and fair course for the Committee to apportion every year some thousands out of their profits towards a very liberal depreciation fund. Alderman Petrie said the Committee had felt for a long time that year by year gas had to meet with greater competition. That, indeed, was one of the reasons which had brought them to see the necessity of materially reducing the price of the gas in Rochdale more quickly than had been the case in former years, in order that the competition might be lessened in that respect. It was also one of the factors which influenced them in their decision to allow something for depreciation. Alderman Baron had been telling them they had depreciated too much, and Alderman Littlewood said it was not enough; so that, as they were between the two, they were perhaps about right. The buildings at the gas-works represented a very small item indeed; and the 1 per cent. was a very fair percentage. Everything else, as they knew, had to be renewed year by year, so that it was kept at one fixed value.

According to a return prepared by the Gas Engineer and Manager (Mr. T. B. Ball), it appears that the quantity of gas sent from the works during the year ended on the 25th of March last, and accounted for by payment, was a little over 297 million cubic feet. This is an increase of about 10 million cubic feet on the figures for the preceding twelve months. The leakage during the year represented a loss of 10½ per cent. on the total supply. In the previous year the loss by leakage was returned at no less than 13¼ per cent. The leakage is now as low as the Gas Committee can expect to get it under existing conditions. Mr. Ball has a very encouraging report to make concerning the residuals department of the gas undertaking. During the past twelve months the income derived from the sale of coke, tar, and sulphate amounted to 6s. 10½d. per ton of coal carbonized. This is 10d. per ton more than was obtained in the preceding year; and nearly 2s. per ton more than could be had in 1886-7—in fact, it is the second best residuals return the Committee have been able to secure since the gas-works were taken over by the Corporation. Through the introduction of the new sulphate plant, a considerable saving has been effected. Though the prices obtainable for some of the principal residuals have improved during the year, that of sulphate has scarcely altered. The sales of this article by the Committee have, however, increased to a rather large extent.

STALYBRIDGE CORPORATION GAS SUPPLY.

The Past Year's Working.

At the Meeting of the Stalybridge Town Council on Monday last week, the members had before them the result of the past year's working of the gas undertaking, some particulars of which were given in the Journal for the 30th ult. (p. 817), from the report of the Engineer, Mr. E. A. Loam.

Alderman Atkinson, Chairman of the Gas Committee, said the hopes and expectations entertained a year ago with regard to an increased consumption had not been realized. They had anticipated—and he thought reasonably so—that the reduction in price, coupled with the normal increase in the number of consumers, would have led to a much larger consumption in the past than in the preceding year. This, however, was not so, for it was practically the same. They made 423,600 cubic feet more gas than in the preceding year, but sold 235,900 cubic feet less. The explanation of this appeared to be, in the first place, the exceptionally mild winter, with, comparatively speaking, very little fog; and, in the second place, some of the mills were working short time during a great portion of the winter, from daylight to dark. Still, the result was rather disappointing. But, on the other hand, it was highly gratifying to find that they had made more gas than last year at a considerably less cost. Having quoted figures as to the working in the past and preceding years, as already given in the Journal, he went on to say that the gross receipts for the past year were £17,472 9s. 1d.; and the expenditure was £12,295 13s. 8d.—leaving a gross profit of £5176 15s. 5d. The sinking fund and interest amounted together to £4290 16s. 8d.; leaving a net profit of £885 18s. 9d. to be carried to the profit and loss account. On referring to the balance-sheet, they would find that the balance brought forward from last year was £4817 11s. 7d., making a total credit balance of £5703 10s. 4d. A year ago it was decided to create an insurance fund; and a sum of £2000 was put aside to form the nucleus of this fund. After seeing the balance-sheet at the end of the year, the Committee considered that the best way to deal with the finances would be to increase this fund to £3000. The sum of £937 1s. had been taken for the purpose; the balance of £62 19s. being interest on the £2000. These made altogether the £3000. It was also agreed last year that a sum equal to one-third of the difference between the price actually charged for gas and the standard price fixed by the Act should be applied as a subsidy to the borough rate. This amounted to £418 15s. 2d., and, together with the amount applied to the insurance fund, represented £3355 16s. 2d. This, taken from the credit balance of £5703 10s. 4d., left a balance of £2347 14s. 2d. to carry forward. They hoped the trade of the district would be in a prosperous condition during the ensuing twelve months, and that the consumption of gas would gradually and steadily increase. He mentioned a year ago the question of gasholder capacity, and said it was a subject that would probably ere long have to occupy their attention. This was now being actively discussed, and it was quite possible that by the winter of 1890 they would, in the ordinary course of events, have a new holder erected at the "Flatts." An expenditure of £12,000 or £13,000 was, however, a serious matter; and before finally committing themselves to it, many things had to be considered. They had heard a good deal lately of water gas, and if all was true that was said about it, the whole of the light-producing agencies of this and every other country would be revolutionized, and both coal gas and electric lighting would have to take a back place. They would do well, perhaps, to accept the published reports with a "grain of salt," until they were further satisfied as to its utility and general adaptation for illuminating purposes. In the meantime they were making inquiries. They were given to understand that this gas could be produced not only very cheaply, but very quickly; and if this was so, it might influence their decision with respect to a new holder. At present, however, the accounts appeared to be too rosy. Cheap gas, as a fuel, was, they perfectly well knew, a complete success; but this did not at all concern them as a Corporation having works for the main purpose of manufacturing and supplying gas for illumination. They were also considering the advisability of putting down improved purifying plant. This would probably be in operation by the commencement of next winter. The rather serious increase in the price of coals behoved them to economize whenever possible. The members of the Committee were not a little startled, when the tenders for coal and cannel were opened, to see the prices quoted. A substantial rise they were prepared for; but they scarcely expected to find it so much and so general as it was. As a set-off, it was somewhat of a consolation to find that tar and liquor had increased in value, which would help to compensate for the high price of coal. The working plant was in good condition. The Manager was watching every point, and straining every nerve to keep things up to the mark, so as to produce satisfactory results. They had, on the whole, every reason to be pleased with the past twelve months' work; and the Manager was to be complimented on the fact that the cost to manufacture the gas was less during the past year than it had ever been previously.

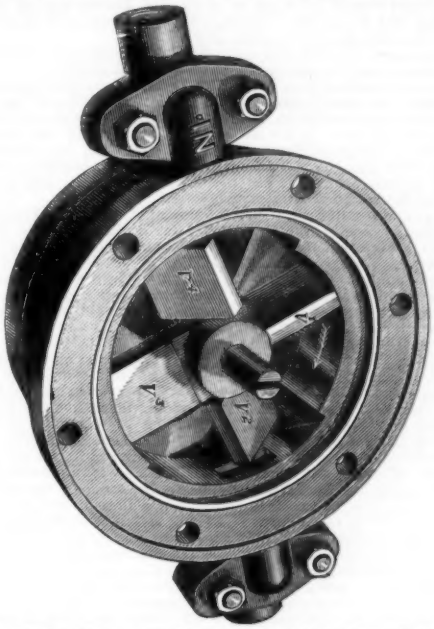
After some discussion, the tenders for coal and cannel were accepted. It was stated, in reference to one order for 3000 tons of coal, that the quantity was 500 tons less than was bought last year from the same contractor, but that the amount of the tender was £208 more. In some instances the rise was as much as 19 per cent.

Burnley Corporation Gas-Works.—At the last meeting of the Burnley Town Council, Mr. Collinge said the Gas Committee considered the report which the Gas Engineer (Mr. J. Petty Leather) had prepared on the working of the gas undertaking in the past year was a very good one. One point in connection with it would be pleasing to the Council generally and to the Finance Committee—viz., that there would be a larger profit than was estimated, probably £1500. The Committee were satisfied with the working of the Gas Department. More gas had been made per ton of coal, as compared with the preceding year; and there had been less loss in its distribution—only 3·9 per cent. having been lost. This was a very small leakage indeed. There had been fixed during the year 107 extra lamps; making the total now 1387. The working expenses had been less than the estimate by about £800; and, on the whole, the Committee considered the report very satisfactory.

Growth of the Bristol Water Supply.—Our readers are aware that the Bristol Water Company are now in Parliament seeking power to carry out certain extensions and alterations of their works; and therefore it may be of interest to give a few figures showing the growth of the undertaking. Under their original Act, obtained in 1846, the Company sought authority to provide Bristol with 3 million gallons of water per day; and actually began with only 400,000 gallons per day. With the works now contemplated, they will be able to give a supply of 15 million gallons per day. The original capital of the Company was £200,000; under the present Bill it will approximate to £1,750,000. The original scheme sought to supply Bristol only; but now the Company's possible customers number 350,000. The pipes of the first supply from the Cold Bath Spring extended over five miles; the total length of aqueducts and pipes now exceeds 50 miles, to which may be added 130 miles of mains distributing water throughout Bristol and its suburbs.

THE "DIFFERENTIAL" POSITIVE WATER-METER.

In view of the revived interest in the subject of the supply of water by measure which has resulted from the recent reopening of the discussion on this question in our "Correspondence" columns, it may not be inopportune to call attention to a water-meter of simple design which is being largely manufactured by the London Water-Meter Company, Limited. The principle of the meter will be readily understood from the accompanying illustration, which shows the instrument with the cover off. The moving parts consist of four vanes, V^1, V^2, V^3, V^4, made of ebonite or metal, and so fixed in a central hub as to allow of a "feathering" motion. There are two spindles crossing one another, each having attached at either end two of the vanes, so arranged that when one is vertical the opposite one lies on edge; the "feathering" being caused by the rolling of the vanes over a rigid quadrant. When lying on its edge (as V^3), the one vane passes through a contracted area, while the



opposite one (V^1) at the same time moves vertically through the measuring segment of the annular chamber; the motion being due to the pressure of water acting on the differential area of the sides and faces of the respective vanes. In practice the working of the meter is uniform and frictionless. The water enters by the inlet, presses against the side of the vane V^1, and also against the edge of V^3; but the side of V^1 being necessarily of greater area than the edge of V^3, the greatest pressure will be exerted on V^1, and the motion will be in the direction of the arrow. When V^1 reaches the position now occupied by V^3, it will be slowly turned over by the striking (or tuning) piece, so as to be in such a position that it will enter the contracted portion. In this position the vane V^3, which is fixed at right angles to it, on the spindle passing through the hub, will be brought into the position now occupied by V^1; so that, by the rotation of the hub and vanes, and by the action of the turning piece, each vane will, in its turn, fit the uncontracted portion of the chamber and measure the water, and afterwards fit and pass through the contracted portion. The water flows through an enlarged area in an almost direct line to the outlet; giving an uninterrupted supply with no perceptible loss of pressure. Tests carried out at the Kew Bridge works of the Grand Junction Water Company and at other places, prove the meter to be unusually sensitive; and on close examination of a number of meters, after long periods of use, no sign of wear can be detected. The two great qualifications required by water engineers would therefore seem to be possessed by the "Differential" meter. As regards construction, the utmost care is taken to make all parts interchangeable, so far as practicable. The cylinders are gun-metal-lined; the vane-spindles are of phosphor bronze; and all other parts of the most substantial kind. In the larger sizes, the great compactness will no doubt be found an additional advantage; the 3-inch meter, for example, occupying a space about 22 in. by 22 in. The transition state in which many water undertakings—more especially those abroad—now are, in changing from a rating to a measuring system of supply, lends additional interest to every advance towards the perfection of water-measuring appliances; and the ingenious design here described appears to be a noteworthy step in the right direction.

Totnes Gas Company.—The annual meeting of this Company was held on Monday last week. The report submitted to the shareholders on behalf of the Directors by the Chairman (Mr. F. Bowden) disclosed a favourable condition of things. It stated that although the price of coals had been higher, and the charge for gas had been reduced 2d. per 1000 cubic feet during the year, the result of the working had been more satisfactory than could have been expected. The Directors recommended a dividend of 10s. per £5 share paid, and that £200 be added to the reserve fund. The report was adopted, and the proposal of the Directors in regard to the dividend agreed to.

The Dublin Corporation and Electric Lighting.—Last Thursday, the Licence to the Corporation of Dublin to manufacture and vend the electric light was received at the City Hall. The Corporation are empowered to erect and maintain electric lines and works, and to supply electric light for "public purposes"—that is for the public lamps and to public buildings in the city—within certain specified districts. There is no power to supply the light for private use. All the requisite powers to establish the works and lay the electric lines overhead or underground are given; and 21 years is the period named for carrying out the project. The Licence to supply the light runs for seven years, but is capable of renewal. The matter will probably be discussed at the next meeting of the Council, and some decision arrived at as to the course to be adopted. It is stated that the necessary works could be completed and all the electric lines laid before September next.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday*.

Mr. A. Smith, the Manager of the Aberdeen Corporation Gas-Works, has presented to his Committee a report on the subject of mechanical stoking, in which he states that, for the purpose of informing himself on the subject, he visited a number of gas-works in England where machinery has been introduced. From the figures which were supplied to him, he found that there was a large saving on stoking, whether the mechanism were driven by manual power, hydraulic power, compressed air, steam power, or wire rope. He considered wire rope, which at Blackburn has resulted in a saving of more than a shilling per ton of coal, to be the most economical; and he recommends this system for Aberdeen. The cost of fitting it up he estimates at £6000; and the saving by its use he places at £1525—the result being brought out in this way: Last year the quantity of coal carbonized was 31,741 tons, at a cost of £4596; and by the new system, the cost would be: Wages, £1980; interest and depreciation, £780; and fuel, oil, &c., £310—total, £3070.

It is announced that the Portobello Gaslight Company is to be constituted a limited liability concern, with an extended capital.

A curious dispute has been settled at Dollar by outside intervention. Last year the Parochial Board took in hand the lighting of the town; and having expended £100 in fitting up lamps, they assessed the ratepayers for the amount. A Mr. Robertson objected; and the matter was referred to the Board of Supervision, who sent Mr. M. M'Neil, their officer, to investigate the matter. He conducted his inquiry locally last week, and though his report has not been sent in, he has given his opinion that the action of the Board is illegal.

Schemes of conversion have become common since Mr. Goschen last year initiated his boldly conceived policy for dealing with the National Debt. The causes which enabled the Chancellor of the Exchequer to take the step he did have operated in smaller undertakings; and the result is that many public bodies have been able to reduce the annual charge upon them for borrowed money. The Edinburgh and District Water Trust did so on Thursday. The debentures of the old Water Company, taken over by the Trust in 1871, bear interest at 4 per cent.; and the Clerk reported that of these they had called up £30,250 at Whitsunday; that £6500 had been renewed at 3 per cent.; and that of the remainder, the holders of £26,930 had taken the option of having mortgages, under the Trustees Act of 1869, for five years, at 3½ per cent., leaving to be re-borrowed £46,820. This sum had been arranged for five years at 3½ per cent. The mortgages falling due amounted to £10,700, and of this there would be paid out of the sinking fund a sum of £10,286; leaving £414 to be re-borrowed, which had also been arranged for for five years at 3½ per cent. Mortgages to the amount of £74,164 were signed at the close of the meeting by the Lord Provost and Mr. Colston. It was reported by the Committee that the cost of working the Deacon meters had been: Four meters, £132 3s. 6d.; diagrams, £3 10s.; assistant in the employ of the Deacon Meter Company, £58 9s. 3d.; assistant employed by Messrs. Leslie and Reid, £27 11s. 3d.; other workmen and superintendence, £108 11s. 6d.—in all, for twelve weeks, £331 0s. 6d. The Engineers were instructed, so soon as they were satisfied with the experiments made by the Deacon Meter Company, to dispense with the Company's assistant, and to bring up a full and complete statement as to the results, showing, in particular, the cause of the waste of water. I understand the services of the assistant have been already dispensed with, and probably the report may be issued before the next meeting. Mr. W. Anderson, an ex-Magistrate of Edinburgh, who, at the last meeting, was elected Treasurer to the Trust, has accepted office; and the Trust on Thursday voted an honorarium of £300 to Mr. J. Oliver, the Collector, who has been discharging the duties of Treasurer since Mr. Cameron's death.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday*.

The amount of gas made during last month at the three works of the Glasgow Corporation Gas Commissioners was 180,819,000 cubic feet, as compared with 168,327,000 feet in the corresponding month of last year; thus showing an increase of 12,490,000 feet, or nearly 7½ per cent. That is certainly a very satisfactory increase. The average illuminating power of the gas during the month was equal to 23 standard candles.

On Monday of this week the annual general meeting of the Airdrie Gaslight Company was held, when a dividend of 11 per cent. was declared, with a bonus of 2s. 6d. per share.

At the monthly meeting of the Helensburgh Police Commissioners last Saturday, the subject of water gas was introduced to the notice of his colleagues by Commissioner Duncan. He recommended that the Commissioners should adopt that kind of gas for lighting the streets of the burgh. It could be manufactured, he said, at a cost of 3¾d. per 1000 cubic feet, while the cost of distribution would amount to about 1s. per 1000 feet. On the suggestion of Mr. Duncan, the Commissioners agreed to ask the Engineer of the Water Gas Company to visit Helensburgh and give a demonstration with the gas as to its suitability for street-lighting purposes. I may here mention that the promoters of the water gas movement have a representative in Glasgow who has a bedroom in the Central Station Hotel fitted up as a dark chamber for demonstrating the great advantages (?) of water gas over ordinary coal gas as supplied to the consumers of gas in this city. I am informed that Mr. Foulis has paid a visit to the dark chamber, where the demonstrations are made, but report does not say that this expert has become a convert to the "new" notions, which I believe he asserts are upwards of twenty years old. By the way, I find it stated that Mr. Donald Graham has retired from the Board of Directors of the North British Water Gas Company. I do not know why he has retired; for the Company has not as yet much more than a merely nominal existence.

The Dumbarton Corporation Gas Commissioners, acting on the recommendation of the Gas Committee, have resolved on extending the retort-house at the gas-works, so as to provide accommodation for twenty-four new retorts, only twelve of which, however, will in the meantime be erected. It is expected that an expenditure of about £900 will be incurred this year. The gas-works are situated in such a position that it is practically impossible to make use of any system of regenerative firing. In submitting the minutes of the Gas Committee to the Commissioners, Provost Babtie explained that there had been an increase of 12½ per cent. in the consumption of gas in the town during the past nine months; while during November, December, and January the works had been taxed to the utmost of their productive power. The Committee had also been forced to procure a superior quality of coal, so as to enable them to meet the demand made upon them by the consumers; and the Provost remarked that it was absolutely necessary that the extension should be made which had been recommended by the Gas Committee.

At last Thursday's monthly meeting of the Coatbridge Town Council, a report was presented by Mr. Chisholm, to whom had been remitted the duty of examining the accounts for 1887-8 submitted in terms of the statute by the Gas Company. He said he found that the maximum dividend had been paid for both years; that it had been paid free of income-tax; that the Company was at liberty to accumulate a reserve fund equal to one-tenth of its capital—namely, £4465—and that, when this sum had been reached, all further accumulation was to cease; that there was a suspense fund account of £3000, together with a balance at the credit of profit and loss account of £1870, being a total of £4370, or only £95 less than the authorized amount; that for 1887 the surplus revenue was £225, and for 1888, £1050; that during 1887 the Town Council paid for public lamps the sum of £700; that the cost of lighting and repairs was £209 6s. 11d., the net amount received by the Gas Company being £490 19s. 6d.; that during 1888 the amount paid for public lamps was £825, while the cost of lighting and repairs was £201, the net amount received by the Gas Company being £624, or £133 more than in 1887. At the conclusion of the report, Bailie Gilchrist drew attention to the fact that it was not legal to pay the maximum dividend free of income-tax; and he said that it was the consumers who were thus paying the tax. The Town Clerk said he had no doubt whatever that it was illegal to do so; and that although himself a shareholder of the Company, he had repeatedly called attention to the illegality. It was remitted to the Town Clerk to call the attention of the Company to the matter.

Yesterday, a Bill to confirm a Provisional Order under the Public Health (Scotland) Act, 1867, and Acts amending the same relating to the Motherwell water supply, was before the Examiners of Standing Order proofs. The Order shows that the petitioners in 1877 introduced a water supply for the burgh of Motherwell, but as since that year the population has increased, and now numbers 17,698, and as the number of manufactories has also largely increased, this supply has become inadequate, and it is necessary to increase it by the construction of new works, &c., in the parishes of Carluke and Carstairs. The Bill was passed as having complied with the statutory requirements. The execution of the scheme is expected to involve an expenditure of at least £11,000.

Scotch pig-iron warrants have come and gone repeatedly in price this week, but the tone over all can scarcely be spoken of as steady. All the outside influences that should contribute to firmness in the market have been present, yet selling has been steadily persisted in; and it was almost with difficulty that values were maintained. It appears as if there were some inherent weakness on the "bull" side; and no stability can be looked for while it exists. Brokers complain of the absence of speculation, as hardly ever before did the public do so little business in warrants. But legitimate trade shows no signs of abatement. Demand on home and Continental account is good; and in the last few days a fair quantity of iron has been taken for New York. No active American inquiry, however, is expected before the autumn, and probably not then. The closing quotation for Scotch iron yesterday afternoon was 44s. 0½d. cash buyers.

Business in the local coal trade continues to be steady; but there is an absence of that activity which characterized it some weeks ago. Generally the quotations are decidedly firm.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 11.

Sulphate of Ammonia.—There is very little change in the market. Its steady tone is preserved, notwithstanding the determination of consumers and dealers to wait events for awhile before making further purchases. Makers continue to realize £12 at Hull, and perhaps a little more at Liverpool; while quotations at Leith do not exceed £11 16s. 3d. The very low value of nitrate has naturally a deterring influence upon sulphate buyers. The latter, while admitting that the relation ship between nitrate and sulphate, and the influence upon one another, must cease under the extraordinary conditions of the relative visible supplies, nevertheless cling to the hope that sulphate prices will be dragged down by the weight and impetus of the nitrate depression. Nitrate is moving off pretty freely; though the deliveries are perhaps not quite up to those of last year. The business is, however, done at low prices—8s. 7½d. per cwt. being now accepted on spot; and due or off-coast cargoes are only worth 8s. 3d. The opinions about the future diverge greatly, but there is hardly one expressive of a lower range of values, while it is generally anticipated that the large interest at stake by the companies will presently cause them to make an effort to impart a more satisfactory tone to the market. As regards the future of sulphate, the maintenance of values seems to be assured, in view of the prospective requirements, and the already perceptible scarcity of liquor.

LONDON, *May* 11.

Tar Products.—Great astonishment is being felt by the old-fashioned tar distillers at the prices which have recently been paid for tar contracts. The explanation, however, is simple enough; as, owing to the advance in the price of carbolic acid, and higher prices for creosote oils, tars which are rich in these are much more valuable than the tar made (say) in London districts and on the east coast, from north country coal, which, as is well known, yields very little of either of these tar products. The purchase of tar on its intrinsic value, like any other article in commerce, must sooner or later commend itself to the common sense of buyers, as to-day's difference between the values of tar, having regard (1) to its mode of production, (2) to the coals from which it is made, and (3) to its subsequent condensation, so alters the constitution of it as will make a relative difference to-day of at least £1 per ton. Business is decidedly slack in all the leading products, with the single exception of creosote, which is both scarce and dearer. Prices: Tar, 20s. to 25s. per ton. Benzol, 90 per cent., 3s. 3d. per gallon; 50 per cent., 2s. 3d. per gallon. Toluol, 1s. 5d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha (30 per cent.), 1s. 1d. per gallon. Light oil, 3½d. per gallon. Creosote, 2½d. per gallon. Pitch, 22s. 6d. per ton. Carbolic acid (crude), 3s. 9d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 17s. 6d. per ton. Anthracene (30 per cent.), "A" quality, 1s. 3½d. per unit; "B," 1s. 1d., according to quality.

Ammonia Products.—Sulphate has a much healthier tone to-day; and it is now thought, with the lessened make and absence of stock, that the "bear" operations with this article will be neutralized. There is a moderate business doing, and important inquiries for prompt delivery. To-day's prices may be taken as follows:—Gas liquor (5° Twaddel), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Sulphate of ammonia, £11 12s. 6d. to £11 17s. 6d., according to position. Liquor ammonia, 2d. per lb. Carbonate of ammonia, from 3d. to 3¼d. per lb. Muriate of ammonia, brown, £19 per ton; white, £23 15s. Sal-ammoniac, £30 to £32 per ton.

THE RECENT STRIKE AT THE HALIFAX GAS-WORKS.—Mr. T. Taylor, one of the late foremen at the Halifax Gas-Works, has addressed to the local papers a long letter in reply to the Mayor's speech at the recent Council meeting (*ante*, p. 867) on the subject of the strike of stokers. He denies the Mayor's statement that Mr. W. Carr, the former Manager, left to the foremen the business of selecting and appointing the stokers, and that the men had to bribe the foremen to obtain appointments. He also contradicts the statement that he was responsible for the collapse of one of the holders early in the present year, while he puts on the Gas Committee and the new management the responsibility for the recent strike and of the failure of the gas supply.

EXTENSIONS AT THE CARLISLE GAS-WORKS.—It has been found necessary to extend the scrubbing appliances at the Carlisle Gas-Works; and it is decided to increase the capacity of the present scrubbers by adding 30 feet to the height of each; making the dimensions, when completed, 75 feet high and 10 feet diameter. Machinery rooms and balconies will also be provided, and the scrubbers filled with boards. The sulphate plant, which is now worked on the closed system, will be rearranged; and Messrs. R. and J. Dempster's open and continuous principle will be adopted. Messrs. Dempster are carrying out the whole of the above-mentioned work.

DARWEN AND THE DINSMORE PROCESS.—Yesterday week the Gas and Water Committee of the Darwen Corporation reported that they had received from the Secretary to the Dinsmore Gas Company a letter enclosing a copy of the following resolution passed at a meeting of the Directors of the Company:—"That an agreement be entered into with the Corporation of Darwen for the use of the Dinsmore patents, on a royalty, during the continuance of the patents, of ¾d. per 1000 cubic feet on all gas made by the Dinsmore process, and that a formal agreement to this effect be prepared." It was resolved that the terms be accepted subject to the approval of the Town Clerk.

THE WATER SUPPLY OF CAPE TOWN.—A Company has been formed with a capital of £100,000, in £5 shares, to construct and maintain a system of water-works to supply the suburbs of Cape Town with water; to take over concessions conferring the right of supplying water to the Municipalities of Woodstock and Claremont; and to acquire certain freehold property, containing springs of water within a short distance of the districts to be supplied. It is believed that these springs will give the Company practically a monopoly of the future water supply. The Company have lately offered 16,000 shares for public subscription, together with £50,000 of 6 per cent. debentures, redeemable at the option of the Company, after ten years, at 10 per cent. premium.

REDUCTIONS IN PRICE.—The Directors of the *Falmouth Gas Company* have reduced to 3s. 9d. per 1000 cubic feet, less a discount of 20 per cent. for prompt payment (making the net figure 3s.), the price of gas used for cooking purposes.——The Gas Committee of the *Padiham Local Board* have decided to reduce the price of gas from 3s. 4d. to 3s. per 1000 cubic feet, with a discount of 5 per cent. to small and 10 per cent. to large consumers; making the net price 2s. 10d. and 2s. 8½d. per 1000 feet respectively.——At the meeting of the *Warrington Town Council* last Tuesday, the Gas Committee reported that they had resolved to reduce the price charged for gas for ordinary street lamps from £2 14s. to £2 each per annum; the larger lamps to be charged *pro ratâ*.

EXHIBITIONS OF GAS APPLIANCES.—During the past week a gas exhibition was held at the Town Hall, Stoke-upon-Trent, by Messrs. H. and C. Davis and Co., of Camberwell. The exhibition was held under the auspices of the Stoke Gas Company; the arrangements being admirably carried out by their Engineer and Manager, Mr. Herman Taplay. A large selection of gas cooking-stoves were shown suitable for all classes. Gas appliances of all descriptions, used either for domestic or manufacturing purposes, were also exhibited, together with a varied collection of cooking utensils. Miss Marian Smithard, who is a first-class *diplomée* of the Kensington School of Cookery, gave demonstrations in cookery free twice daily; and these were largely attended by ladies.——The Sleaford Gas Company, Limited, purpose holding a second gas exhibition in the Corn Exchange in that town on Tuesday, the 28th inst., and three succeeding days; the arrangements being under the supervision of Mr. H. Wimhurst, the Company's Engineer and Manager. Miss H. M. Young, of Warrington, will give a series of lectures on cookery on the occasion.

HEYWOOD CORPORATION GAS SUPPLY.—At the meeting of the Heywood Town Council last Thursday, the Gas Committee reported that they had resolved on the following disposal of the profit of £1740 17s. 11d. realized on the gas undertaking during the past year—viz., £334 18s. 8d. to the credit of the capital account, £935 13s. 9d. to the reserve fund, and the balance of the profit to be ultimately carried to the credit of the district fund in relief of next year's rates. They had also resolved that the price of gas to ordinary consumers should be 4s. per 1000 cubic feet, with a discount of 8d. per 1000 feet for prompt payment; and that the gas supplied for stoves and motive power be 2s. 11d. per 1000 feet. Mr. Lawton, in moving the adoption of the report, said the analysis of the revenue for the year ended March 25 last, showed a very favourable result of the working of the department. He then supplemented the particulars given in the JOURNAL last week (p. 869) by a few other details; and concluded by remarking that, considering the fixed charges, the works would bear favourable comparison with any in Lancashire. Mr. Stafford seconded the motion, and it was carried after a short discussion.

THE GAS SUPPLY OF BURLEY-IN-WHARFEDALE.—At the monthly meeting of the Burley-in-Wharfedale Local Board yesterday week, the minutes of two special meetings of the Board were presented, from which it appeared that the Local Board had offered the Gas Company £1350 for their plant, and that the offer had been accepted. Some discussion took place; and an estimate by Mr. W. W. Wedgwood (the Manager of the Ilkley Gas Company) as to the cost of plant for manufacturing gas was submitted—the amount being £2500. The plant embraced in the estimate, it was stated, would be capable of producing 10 million cubic feet of gas per annum, and it provides for a gasholder of 56,500 feet capacity—sufficient to meet the requirements of the longest night in winter. A suggestion was made that the Otley Gas Company should be asked to state upon what terms they would supply gas to Burley; and a Committee was appointed to obtain that information, and also particulars as to the cost of a site, buildings, and works for the Board. It was resolved that the Clerk should write to the Local Government Board asking the longest period they would allow for the repayment of money borrowed for gas-works.

PROPOSED ELECTRIC LIGHTING COMPANY FOR HULL.—A meeting was held at Hull last Wednesday week (at which, it is reported, there was but a small attendance), to consider the advisability of establishing a company for the supply of electricity in certain of the principal thoroughfares. Mr. R. Murray was voted to the chair. In the course of his remarks, he said that a strong feeling against the electric light existed in Hull; and this arose owing to the unsatisfactory nature of the light when it was introduced into the town in 1883-4, which was in consequence of insufficient plant and using old wires. He pointed out the "advantages" of the electric light over gas; and then stated that, in speaking to a member of the Town Council about the matter, he was told that, if they carried wires overhead, there would not be a word said against it, and the Board of Trade would not interfere if they did not come into contact with the post-office wires. He put the cost of the plant roughly at £6000; and with all the fittings that would have to be put into the buildings, it would bring it up to £12,000. The cost to consumers he estimated would be less than the present price of gas. Some discussion took place; and it was advised that the promoters should canvass the proprietors of establishments in the district which it was intended to supply, with a view to approaching the Corporation in the matter.

TUNBRIDGE WELLS WATER SUPPLY.—The action which the Tunbridge Wells Local Board brought against the contractor (Mr. Bradshaw) for the construction of the reservoir at Pembury, on the ground that the reservoir leaked, but which action has now been abandoned, has cost the ratepayers close on £1400.

ALDERMAN SPARK'S CHARGES RESPECTING LEEDS GAS.—It will be remembered that some time ago, on account of the allegations made by him as to the low illuminating power of the Leeds gas, Alderman Spark was requested by the Gas Committee of the Corporation to attend before them, and submit for their consideration the data upon which his assertions were based. At first he declined to comply, feeling that he could not be fairly judged by the accused. The subject was referred to at a meeting of the Town Council a month ago; and on a suggestion from the Mayor addressed to Alderman Spark and also to Mr. Gilston, the Chairman of the Committee, the former agreed to present his case to the Committee. A meeting for this purpose was held last Friday; and, by invitation, the Mayor (Alderman Ward) and the Town Clerk (Sir G. W. Morrison) were also present. Alderman Spark asked that an inquiry should take place, and that he should be furnished with the particulars of official tests of the illuminating power of the gas and as to the coal contracts, in order that these questions might be gone into, and that he might be able to call witnesses in support of his contention. The Committee duly assented to both proposals; but left the date of the inquiry undecided.

THE PAST YEAR'S WORKING OF THE COLNE GAS UNDERTAKING.—At the meeting of the Colne and Marsden Local Board last week, Mr. Hartley, the Chairman of the Gas Committee, made a statement respecting the past year's working of the undertaking. From this it appeared that the total income was £9391 15s. 4d., the profit on the year's working being £358 3s. 1d. The amount in hand for meter deposits was £500 10s., compared with £445 10s. at the beginning of the financial year. The mortgage loans on gas account had been reduced from £43,639 9s. 10d. to £41,222 5s. 8d. There had been £2417 4s. 7d. expended in various items, including extensions of mains and erecting a new gasholder and purifiers. Mr. Hartley thanked the Board for the interest they had taken in the proposed extension of the gas-works by visiting the works at Bury, Keighley, Blackburn, and Leeds. He believed the information gained would be of great benefit to the ratepayers. In making these visits what had struck him was that the price of gas was lowest where the lowest interest was paid on capital account. At Leeds, the price was 1s. 9d. per 1000 cubic feet, and the lowest interest on capital account was paid there. The Corporation had apparently effected many of their extensions out of revenue, and they were therefore in a position to keep down the price of gas.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 896.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	11 Apr.	10½	Alliance & Dublin 10 p. c.	10	18½—19½	..	5 7 8
100,000	10	„	7½	Do. 7 p. c.	10	15—14	..	5 7 2
300,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	100	111—113	+1	4 8 6
100,000	20	29 Nov.	10	Bahia, Limited	20	24—26	..	7 13 10
200,000	5	14 Nov.	7½	Bombay, Limited	5	7¼—7½	+¼	4 16 8
40,000	5	„	7½	Do. New	5	6¾—6¾	..	5 4 2
380,000	Stck.	14 Feb.	11½	Brentford Consolidated	100	229—234	..	5 0 6
125,000	„	„	8½	Do. New	100	167—172	..	5 1 9
220,000	20	14 Mar.	10½	Brighton & Hove, Original	20	42—44	..	4 15 5
320,000	20	28 Mar.	11½	British	20	45—47	..	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20—22	..	5 0 0
89,000	10	„	8	Do. 7 p. c.	10	13½—14½	..	5 10 4
338,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	15—16	..	5 0 0
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	107—110	..	5 9 1
150,000	20	28 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	11 Apr.	13½	Commercial, Old Stock	100	268—278	−2	5 0 8
130,000	„	„	10½	Do. New do.	100	214—219	..	4 18 2
130,000	„	28 Dec.	4½	Do. 4½ p. c. Deb. do.	100	123—128	..	3 10 8
557,320	20	13 Dec.	13	Continental Union, Limited	20	47—49	..	5 6 2
242,680	20	„	13	Do. New '69 & '72	14	33½—35½	..	5 8 5
200,000	20	„	10	Do. 7 p. c. Pref.	20	38—40	..	5 0 0
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	204—208	..	4 16 2
234,060	10	30 Jan.	13	European, Limited	10	25½—26½	..	4 18 1
120,000	10	„	13	Do. New.	7½	17½—18½	..	5 5 3
854,060	10	„	13	Do. do.	5	12½—13½	..	4 16 3
5,468,600	Stck.	14 Feb.	13	Gaslight & Coke, A, Ordinary	100	252—256	−3	5 1 6
100,000	„	„	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	100	258—263	−2	3 16 1
30,000	„	„	5	Do. F, 5 p. c. Prf.	100	123—128	..	3 18 1
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 2
1,800,000	„	„	7	Do. H, 7 p. c. max.	100	168—173	−2	4 0 11
468,000	„	„	10	Do. J, 10 p. c. Prf.	100	257—262	−1	3 16 4
1,051,150	„	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	119—122	..	3 5 7
294,850	„	„	4½	Do. 4½ p. c. do.	100	126—130	..	3 9 3
650,000	„	„	6	Do. 6 p. c. do.	100	174—179	..	3 7 0
8,600,000	Stck.	14 Nov.	10	Imperial Continental	100	213—217	−1	4 12 9
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p.c. Deb.	100	113—115	..	4 6 11
541,920	20	29 Nov.	6	Monte Video, Limited	20	18½—19½	..	6 3 1
150,000	5	29 Nov.	10	Oriental, Limited	5	9½—10	..	5 0 0
60,000	5	28 Mar.	7	Ottoman, Limited	5	6½—6¾	..	5 3 8
166,870	10	16 Jan.	4	Pará, Limited	10	5½—6	..	6 18 4
420,000	100	2 May	6	People's Gas of Chicago—1st Mtg. Bds.	100	101-105*	..	5 14 3
500,000	100	1 Dec.	6	2nd Do.	100	98—100	..	6 0 0
100,000	10	26 Apr.	10	San Paulo, Limited	10	16—17*	..	5 17 8
500,000	Stck.	28 Feb.	10½	South Metropolitan, A Stock	100	317—322	..	5 0 11
1,850,000	„	„	12½	Do. B do.	100	241—246	−2	4 18 7
141,500	„	„	12½	Do. C do.	100	260—270	..	4 18 1
600,000	„	28 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137—140	..	3 11 6
60,000	5	28 Feb.	11½	Tottenham & Edm'ton, Orig.	5	11—13	..	4 8 5
						*Ex div		
				WATER COMPANIES.				
717,467	Stck.	28 Dec.	9	Chelsea, Ordinary	100	257—262	..	3 8
1,720,560	Stck.	11 Apr.	7½	East London, Ordinary	100	204—208	..	3 12 1
700,000	50	13 Dec.	9	Grand Junction	50	122—126	..	3 11 5
708,000	Stck.	14 Feb.	10½	Kent	100	272—277	..	3 15 9
1,043,800	100	28 Dec.	9	Lambeth, 10 p. c. max.	100	250—255	−1	3 10 7
406,200	100	„	7½	Do. 7½ p. c. max.	100	199—204	..	3 13 6
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118—120	..	3 6 9
500,000	100	14 Feb.	12½	New River, New Shares	100	348—353	..	3 8 8
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	100	125—128	..	3 2 0
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10 p.c. max.	100	175—180	..	3 6 8
126,500	100	„	6	Do. 7½ p. c. do.	100	162—167	+1	3 11 10
1,155,066	Stck.	13 Dec.	10	West Middlesex	100	264—269	..	3 14 4

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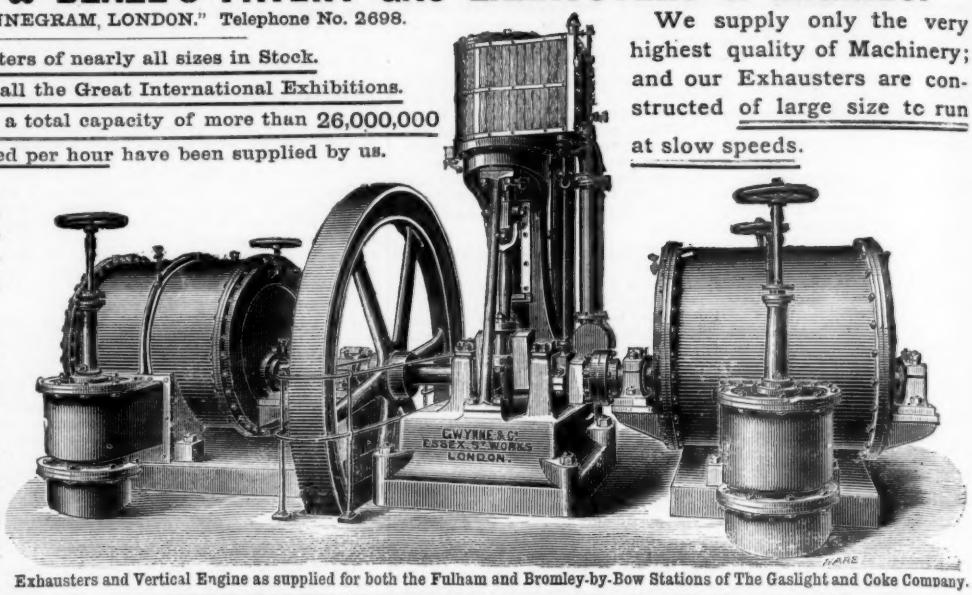

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*** See Advertisement on Page III. of the Wrapper of last week's issue.

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*** See large Advertisement in last week's issue, page 840.

SULPHATE of Ammonia Lead Work and Fittings. Lead Burner. Tanks and Saturators made and repaired on the shortest notice.
Address P. J. DAVIES, 78, Earl's Court Road, Kensington, LONDON.

THE Wenham Company, Limited, who have opened a Branch at Birmingham, having SPARE SPACE, are desirous of arranging with a first-class Firm for the DISPLAY AND SALE OF THEIR GOODS, on a fair and equitable basis. Exceptionally handsome Premises in the leading Thoroughfare.
Address MANAGER, 121, Corporation Street, BIRMINGHAM.

FOR SALE, to close a Partnership Account—About 20 new BOWER LAMPS, assorted, of 10 and 15 feet. Liberal discount to clear.
Apply COPE, 146, Miller Street, Aston Road, BIRMINGHAM.

TO GAS-METER MAKERS AND OTHERS.

TO be disposed of, as a going concern, THE OLD-ESTABLISHED BUSINESS OF GAS-METER MANUFACTURERS as carried on by the late Denis Murphy, under the style or firm of FLETCHER AND MURPHY, at Garratt Street Works, Oldham Road, Manchester.
Application to be made for particulars to Jos. CULLEN, 101, Bishopsgate Street Within, LONDON; or Messrs. SHIPPEY AND JORDAN, Solicitors, 15, Cooper Street, MANCHESTER.

SOUTH METROPOLITAN GAS STOCK, PRESENTING A SOUND INVESTMENT.

BY ORDER OF THE EXECUTORS OF THE LATE W. BROWN, ESQ.

MR. G. A. WILKINSON will Sell by Auction, at the Mart, on Monday, May 27, at One, in Lots, £2300 "B" STOCK in the SOUTH METROPOLITAN GAS COMPANY, paying a Dividend of £12 2s. 6d. Per Cent.
Particulars of Messrs. MARCHANT AND BENWELL, Solicitors, 8, George Yard, LOMBARD STREET, and Broadway, DEPTFORD; and of Mr. G. A. WILKINSON Land Agent and Auctioneer, 7, Poultry, CITY.

CORPORATION OF LONGTON.

GASHOLDER, ETC., FOR SALE.

THE Gas Committee have the following Plant FOR SALE (in good condition), and are prepared to receive OFFERS for the same:—

GASHOLDER 60 feet diameter and 23 feet deep, and Framework.

CAST-IRON VERTICAL CONDENSER, suitable for a daily make of 250,000 to 300,000 cubic feet.

For further particulars and to view, apply to the undersigned.

W. W. HULME,
Secretary and Manager.

Gas-Works, Longton, Staffordshire,
May 11, 1889.

THE Haslingden Union Gas Company invite TENDERS for the supply of GAS COAL for One, Two, or Three years. Quantity required, about 5000 tons annually.

Tenders not later than Saturday, the 25th of May inst.

WOODCOCK AND SONS,
Secretaries.

West View, Haslingden,
near Manchester, May 3, 1889.

THE BRISTOL UNITED GASLIGHT COMPANY.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Bristol United Gaslight Company are prepared to receive TENDERS for the Supply of their requirements (say, 150,000 tons) of GAS COALS during a period of One year, commencing the 1st of July next.

Particulars and forms of tender may be obtained on application to the undersigned, to whom also tenders, sealed, and endorsed "Tender for Coal," must be delivered not later than Ten a.m., on Monday, the 3rd day of June next.

JAS. V. GREEN, Secretary.

Gaslight Offices, Canon's Marsh,
Bristol, April 26, 1889.

LEEK IMPROVEMENT ACT, 1855.

THE Leek Improvement Commissioners invite TENDERS for a supply of best screened GAS COAL and NUTS for One, Two, or Three years from the 1st of July next, to be delivered at the Leek Station on the North Staffordshire Railway, at such times and in such quantities as may be required. Annual consumption about 3500 to 4000 tons.

Sealed tenders, addressed to the Chairman of the Gas Committee, Leek, to be delivered by Four o'clock in the afternoon of Monday, the 13th of May, 1889.

The lowest or any tender will not necessarily be accepted.

Further particulars may be obtained from the undersigned.

By order of the Commissioners,
C. HENSHAW, Clerk.

Town Hall, Leek, April 29, 1889.

TAUNTON GASLIGHT AND COKE COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the supply of GAS COAL for delivery over One year, commencing the 1st of July next.

Particulars to be obtained of the undersigned, to whom tenders, sealed and endorsed, may be delivered not later than the 1st of June next.

ALFRED EDWARDS,
Secretary and Manager.

May 4, 1889.

TENDERS FOR GAS COAL.

THE Gas Committee of the Stockton Corporation invite TENDERS for the supply, in whole or in part, of 24,000 tons of clean, well-screened or treble NUTS GAS COAL, similar in quality to sample wagon, to be supplied to the Gas Committee, if so requested.

The Coal to be delivered, free from all dues, in the Gas-Works Siding, in a dry state; free from Dirt, Shale, or other impurities, and in such daily quantities as may from time to time be directed by the Gas Manager.

Payments will be made monthly after each Council Meeting.

The Gas Committee do not bind themselves to accept the lowest or any tender.

Tenders, specifying the quantity and description of Coal offered, to be sealed and endorsed "Tender for Gas Coal," to be lodged with me on or before the 29th day of May, 1889.

WM. FORD, Manager.

Corporation Gas Works,
Stockton-on-Tees, May 6, 1889.

BOROUGH OF CHORLEY.

TO COLLIERY PROPRIETORS, TAR DISTILLERS, AND OTHERS.

THE Chorley Corporation are prepared to receive TENDERS for the supply of all the GAS COAL required at their Gas-Works, for a period of One, Two, or Three years, from the 1st of September next.

Also for the supply of about 500 tons of CANNEL during Twelve months, from the 1st of June next.

Also for the purchase of the SURPLUS TAR produced at their Gas-Works during Twelve months, commencing the 1st of July next, delivered in Contractor's Tanks at the Chorley Railway Station. Approximate quantity, 400 tons.

Forms of tender for Gas Coal, and further information respecting any of the tenders, may be obtained on application to Mr. William Blackledge, Gas Manager, Chorley.

Sealed tenders, endorsed "Gas Coal," "Cannel," or "Tar," as the case may be, to be sent to the undersigned, before Noon on Wednesday, the 22nd of May, 1889.

The Corporation do not bind themselves to accept any tender.

By order,
THOS. A. JACKSON, Town Clerk.

Town Hall, Chorley, April 30, 1889.

THE Directors of the Ongar Gas Company, Limited, invite TENDERS for the supply of GAS COALS, delivered at Ongar Railway Station, for One year, commencing Nov. 1 next.

Quantity, about 300 tons.

W. H. CHILDS, Secretary.

Ongar, Essex.

CITY OF MANCHESTER.

TENDERS FOR COAL AND CANNEL.

THE Gas Committee are prepared to receive, on or before the 23rd of May next, OFFERS of high-class CANNELS and COALS, suitable for Gas Making, for delivery at their Gaythorn, Rochdale Road, and Bradford Road Works, during a period of One, Two, or Three years, commencing the 1st of November, 1889.

Particulars and printed forms of tender may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent, Gas Department, Town Hall, Manchester.

By order of the Gas Committee,
JOSEPH HERON, Town Clerk.

Town Hall, Manchester, April 26, 1889.

ULVERSTON LOCAL BOARD.

TO TAR DISTILLERS AND OTHERS.

THE Gas and Water Committee are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works, for a period of One or Two years, commencing the 1st of July next.

Information as to quantity, &c., may be had on application to the undersigned.

Sealed tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Tar," to be sent in not later than the 30th inst.

The Committee do not bind themselves to accept the highest or any tender.

JNO. SWAN, Engineer and Manager.

ULVERSTON LOCAL BOARD.
(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for the supply of CANNEL COAL for Gas purposes, to be delivered in such quantities as may be required by the Manager during a term of One or Two years, commencing July 1, 1889.

The Cannel offered must be free from all Bats, Pyrites, and Dross.

Parties tendering must give full particulars of the Cannel offered, and the name of the Colliery from which they propose to supply, and state the price per ton delivered carriage paid to Ulverston Station, or delivered free by boat at Ulverston Canal Basin.

Sealed tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Cannel," to be sent in not later than the 30th inst.

The Committee do not bind themselves to accept the lowest or any tender.

Forms of tender and further information may be obtained on application to the undersigned in writing.

JNO. SWAN, Engineer and Manager.

C. & W. WALKER.

GASHOLDERS; PURIFIERS;

PURIFYING MACHINES;

CO$_2$ AND TAR-EXTRACTING WASHERS; SCRUBBERS;

SULPHATE & SULPHUR PLANT;

RETORT MOUTHPIECES; CONDENSERS;

LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;

SLIDE VALVES; TAR BURNERS; &C., &C.,

WOOD SIEVES.

ADDRESSES:

8, Finsbury Circus, London, E.C.; Midland Works, Donnington, Salop.

"FORTRESS LONDON," "FORTRESS DONNINGTON."—Telegraphic.

THE JOHANNESBURG GAS COMPANY,

LIMITED.

Registered under the Limited Liability Law of the South African Republic.

NOMINAL CAPITAL, £200,000,

In 200,000 Shares of £1 each, of which 130,000 are now issued; the balance being held in reserve for possible future requirements.

SOUTH AFRICA.

DIRECTORS:

JAMES SIVEWRIGHT, Esq., C.M.G., M.L.A. (Chairman of the Water-Works Estate and Exploration Company), *Chairman.*
JAMES DELL, Esq. (late Traffic Manager of the Cape Government Railways), Johannesburg, *Deputy-Chairman.*
W. G. ANDERSON, Jun., Esq. (of Messrs. Wm. Anderson and Co., Cape Town).
The Hon. WM. ROSS, M.L.C., Johannesburg.
OTTO STAIB, Esq. (late Manager of the French Diamond Mining Company, Kimberley Mine).
W. E. DAWSON, Esq. (Analyst and Assayer to the Government of the South African Republic, Pretoria and Johannesburg).

BANKERS:

CAPE OF GOOD HOPE BANK, Limited, Cape Town and Johannesburg.
London Agents: LONDON AND WESTMINSTER BANK, Limited, Lothbury, London, E.C.

SECRETARIES (pro tem.):

Messrs. ROSS, PAGE, & O'REILLY, Johannesburg.

LONDON.

DIRECTORS:

W. M. FARMER, Esq., 18, Bina Gardens, South Kensington (Director of the Gold Fields of South Africa, Limited).
DONALD FRASER, Esq., Tickford Park, Newport Pagnell.
ALFRED JONES, Esq., Bury Street, London, E.C. (Director of the Durban-Roodepoort Gold Mining Company, Limited).

AGENTS:

Messrs. DAVIS and SOPER, Bury Street, St. Mary Axe, E.C.
Telegraphic Address: "Reposnos London."

SOLICITORS:

Messrs. ASHURST, MORRIS, CRISP, & Co., 6, Old Jewry, E.C.

CONSULTING ENGINEER:

THOS. NEWBIGGING, Esq., C.E. (Past-President of The Gas Institute of Great Britain), 5, Norfolk Street, Manchester.

Prospectus.

This Company has been formed to supply Johannesburg with Gas. It has acquired the Concession granted to Messrs. Dawson and Hamilton by the Government of the South African Republic, the salient points of which are—

1. The Concession grants the right for laying pipes in the public streets and roads of Johannesburg and the suburbs, for the purpose of supplying the Government and private parties with Gas, made and extracted from coal or other material proposed by the Concessionaire and approved of by the Government, for lighting, warming, and motive power.
2. It gives an exclusive right to the above for a period of fifty years, and expires on the 15th of October, 1938.
3. The Government are to receive one-quarter of the net profits resulting from the Gas operations, after a clear sum equivalent to 10 per cent. upon the issued Capital has been retained by the Company, thus: If, say a profit of 20 per cent. is earned, the Government will receive 2½, and the Company 17½ per cent.

Copies of the Concession can be obtained at a cost of Sixpence each on application to either the Secretaries or the London Agents.

Mr. Thomas Newbigging, M. Inst. C.E., and Past-President of The Gas Institute of Great Britain, recently visited South Africa, with a view to determining whether the coal known to exist within a reasonable distance of Johannesburg is suitable for gas and coke producing purposes; and, in the event of such coal being found, to select a site for the establishment of a manufactory, and to design such manufactory with the necessary machinery and plant for the supply of Gas for lighting, warming, and motive powers to the town and its suburbs.

In an elaborate report on the subject, Mr. Newbigging, after testing twenty-seven samples of coal submitted to him from different parts of the country, states that he "found seven that are less or more suitable for gas making." "Each of these," he goes on to say, "is equal in quality to average English bituminous coals, and will yield, with ordinary good working, between 9000 and 10,000 cubic feet of gas per ton of about 15 standard candles illuminating value, with a consumption of 5 cubic feet of gas per hour.

"It is difficult to forecast the future of Johannesburg; many of those best capable of judging predict that, in the course of the next three years, the place will contain three or four times the present number of inhabitants. At the present time (January, 1889) the white population is variously estimated at 12,000 to 15,000. My own observation leads me to belive that the former figure at least is not an exaggerated one, and there is a large daily influx of new comers.

"The public lamps in the streets of the town and its suburbs will exceed 2000 in number.

"I have selected a site for the gas-works. This is about the lowest part of the district, and is situated on the Government portion of the farm 'Braamfontein,' in a westerly direction from the town, but in immediate proximity thereto. The site, six acres in extent, is granted by the Government free, in accordance with the terms of the Concession. It is of ample extent, and is well adapted for works capable of producing many times the present prescribed minimum make; so that, as the town and its suburbs grow, there is ample room for future extensions.

. . . . . .

"By Article 29 of the Concession, the price of the gas supplied to private individuals is not to be higher than 'one halfpenny per cubic foot,' and to the Government not higher than one farthing per cubic foot, equivalent to £2 1s. 8d. and £1 0s. 10d. per 1000 cubic feet respectively.

"Assuming that an average of 20s. per 1000 cubic feet is charged all round to begin with, I estimate that the minimum net profit on a consumption of 30,000,000 cubic feet will be £17,000. At 17s. 6d. per 1000, the profit may be set down at £13,000; at 15s. per 1000, £10,000.

"This estimate of profit I have reason to believe is well within the mark. It is highly probable that there will be a large consumption of gas for heating and cooking purposes; and with efficient management and a good market for the residual products, a considerably larger profit will be realized. Again, as the consumption of gas increases, by reason of the growing population of the town and district, the increase in the revenue will be in a greater ratio than that of the further capital expenditure required.

"Viewing the whole circumstances of the proposed undertaking, I am of opinion that its prospects of success are as bright as could be wished, and that it offers to Capitalists the promise of a substantial and secure investment."

It is intended to acquire, provided it can be secured on reasonable terms, one of the best gas coal mines, so far as they have hitherto been proved, in the Transvaal. The Government has granted permission to the Company to sell coal to the outside public.

All the shares now issued have been taken up privately.

THE Directors of the Brierley Hill District Gaslight Company invite TENDERS for the supply of 5000 to 6000 tons of GAS COAL or GAS NUTS, to be delivered, in quantities as required, from the 1st of July, 1889, to June 30, 1890, to Brettell Lane Station and Round Oak Siding, G.W.R.

Tenders to be sent in not later than the 25th inst.

The Directors do not bind themselves to accept the lowest or any tender.

HENRY M. JACKSON, Secretary.

Board-Room, Gas-Works,
Brierley Hill, May 6, 1889.

CORPORATION OF BLACKPOOL.

THE Gas Committee are prepared to receive TENDERS for the supply of COAL and CANNEL for the next Twelve months, from June 1.

Form of tender may be had on application to the undersigned.

Tenders, endorsed outside "Tender for Coal or Cannel," must be sent in, addressed to the Chairman, by the 25th of May.

By order,
JOHN CHEW, Gas Engineer.

ROCHDALE CORPORATION.

TO IRONFOUNDERS AND OTHERS.

THE Gas Committee of the Corporation invite TENDERS for the supply of about 500 yards of 3-inch Cast-Iron Spigot and Socket PIPES, turned and bored, in 9-feet lengths, to weigh about 53lbs. per yard, coated with Dr. Smith's Solution.

Tenders, endorsed "Pipes," and stating price per ton delivered at Rochdale Station, must be sent to me not later than Noon on Wednesday, the 22nd of May, 1889.

By order,
ZACH MELLOR, Town Clerk.

Town Hall, Rochdale, May 9, 1889.

ROCHDALE CORPORATION.

TO IRONFOUNDERS AND OTHERS.

THE Gas Committee of the Corporation invite TENDERS for the supply of 80 Cast-Iron RETORT MOUTHPIECES (not to include lids). Size: 20-inch by 15-inch D to 18-inch Circular.

Sample may be seen at the Gas-Works, and any further information obtained on application to Mr. T. Banbury Ball, the Manager.

Tenders, endorsed "Retort Mouthpieces," must be sent to me not later than Noon on Wednesday, the 22nd of May, 1889.

By order,
ZACH. MELLOR, Town Clerk.

Town Hall, Rochdale, May 9, 1889.

FARNWORTH AND KEARSLEY GAS COMPANY.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Farnworth and Kearsley Gas Company are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works, together or separately, for a term of One or Two years.

Sealed tenders, addressed to James Warburton, Esq., Chairman, and endorsed "Tender for Tar and Ammoniacal Liquor," must be delivered on or before Saturday, May 25 next.

Forms of tender, or any further information required, may be obtained from the undersigned.

THOMAS LEA SHEPPARD, Manager.

Gas Offices, Farnworth, near Bolton,
May 9, 1889.

BOROUGH OF DARWEN.

SUPPLY OF GAS COAL.

THE Corporation are prepared to receive TENDERS for the supply of about 10,000 tons per Annum of best GAS COAL (screened Cobbles and Nuts), for One, Two, or Three years.

Specification and forms of tender, with further particulars, may be obtained from Mr. Thos. Duxbury, Gas-Works Manager, Darwen.

Tenders, sealed and endorsed "Tender for Coal," to be addressed to me and delivered at my Office at or before Noon on Thursday, the 23rd of May inst.

The Corporation do not bind themselves to accept the owest or any tender.

By order,
CHAS. COSTEKER, Town Clerk.

Town Clerk's Office, Darwen,
May 6, 1889.

WINDSOR ROYAL GASLIGHT COMPANY.

SUPPLY OF GAS COALS.

THE Directors of the Windsor Royal Gaslight Company invite TENDERS for the supply of 12,500 tons of GAS COALS, to be delivered free at the Windsor Station of the Great Western Railway, such Coals to be either of the following description—viz., New Pelton, Pelaw Main, Ravensworth Pelaw, or Holmside.

The Coals to be delivered as follows—viz., April, 1890, 400 tons; May, 400 tons; June, 400 tons; July, 400 tons; August, 400 tons; September, 550 tons; October, 650 tons; November, 650tons; December, 650 tons; January, 1891, 600 tons; February, 600 tons; March, 550 tons; the same quantities for the twelve months following—the Company having the option of increasing the quantity by 50 tons in any of the months at the contract price per ton for any extra quantity so required.

The Contractor to state for which description of Coals he tenders, as none other than those specified will be received.

The Directors will not entertain any conditional tender, or be bound to accept the lowest or any tender.

Tenders to be delivered on or before Monday, the 3rd day of June, 1889, addressed to the Secretary, Gas Offices, Windsor.

By order,
GEORGE CARTLAND, Secretary.

Gas Offices, Victoria Street, Windsor,
May, 1889.

WARWICK GASLIGHT COMPANY.

TO TAR DISTILLERS.

THE Committee of the Warwick Gaslight Company are desirous of receiving TENDERS for the purchase of their surplus TAR, for One or Three years, commencing July 1 next.

Tenders to be sent to the undersigned not later than June 11, 1889.

WALTER T. TEW, Manager.

Gas-Works, Warwick, May 8, 1889.

WIDNES LOCAL BOARD.

TENDERS FOR SUPPLY OF GAS COAL.

THE Widnes Local Board invite TENDERS for the supply of about 8000 tons of GAS COAL, and about 3000 tons of SLACK, to be delivered at their Gas-Works, Widnes.

Conditions and forms of tender may be obtained from Mr. Carr, Gas Engineer, Widnes.

Tenders to be addressed to the Chairman of the Gas Committee, endorsed "Gas Coal," and delivered to the undersigned not later than Ten a.m. on the 27th inst.

The Board do not bind themselves to accept the lowest or any tender.

JAS. T. ALLEN, Clerk.

Town Hall, Widnes, May 7, 1889.

TENDERS FOR GAS COAL.

THE Directors of the Slough Gas and Coke Company are prepared to receive TENDERS for the supply of 1800 to 2000 tons per annum of GAS COAL, screened or unscreened, to be delivered at the Slough Station of the Great Western Railway, during a period of One or Two years respectively from the 1st of July next, in monthly quantities as may be required.

Payment for Coals within the following month after delivery.

Tenders to be delivered to the undersigned, endorsed "Tender for Gas Coal," on or before Tuesday, the 11th day of June next.

The Directors do not bind themselves to accept the lowest or any tender.

ARTHUR THOMAS, Secretary.

High Street, Slough, Bucks.,
May 8, 1889.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Slough Gas and Coke Company are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR (or either) produced at their Works, for a term of One year, from the 30th of June, 1889.

The Slough Branch of the Grand Junction Canal is available.

The estimated quantities to be produced are: Tar, 20,000 gallons; and Liquor, 45,000 gallons.

Further particulars may be obtained on application to the undersigned.

Sealed tenders, stating price for Tar per barrel of 36 gallons, and prices for Ammoniacal Liquor per 1000 gallons of different strengths, at the Company's Works, and endorsed "Tender for Tar and Liquor," to be delivered on or before Tuesday, the 11th of June next.

The Directors do not bind themselves to accept the highest or any tender.

ARTHUR THOMAS, Secretary.

High Street, Slough, May 8, 1889.

TO COLLIERY PROPRIETORS AND COAL MERCHANTS.

THE Directors of the Gravesend and Milton Gaslight Company are prepared to receive TENDERS for the supply of GAS COAL for their Works, near the Canal, Gravesend.

Tenders should quote one price f.o.b.; and an alternative price alongside in the Canal Basin.

The Company pay Canal Dues.

The Company will not accept any tender which purports to deliver the Coals out of Lighters.

Every tender should quote for One and Three years, from the 25th of June, 1889.

The quantity required will probably amount to from 8000 to 10,000 tons per Annum; but the Company do not guarantee this or any other quantity.

The Directors do not bind themselves to accept the lowest or any other tender.

In the event of their accepting any tender, the successful person must sign a contract, a copy of which can be s en at my Offices, 27, King Street, Gravesend.

Tenders, sealed, and marked outside "Tenders for Coal," must be sent to my Offices on or before June 4, at Noon, addressed to the Chairman and Directors of the Gravesend and Milton Gaslight Company.

By order,
CHAS. R. GRAMSHAW, Secretary.

27, King Street, Gravesend,
May 9, 1889.

TO CHEMICAL MANUFACTURERS & OTHERS.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Gravesend and Milton Gaslight Company are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR of the Company, from the 25th of June, 1889.

The contract will terminate on the 24th of June, 1890.

The purchaser will be required to sign a contract, a copy of which can be seen at my Offices.

The Tar and Liquor will be delivered free into the purchaser's barges alongside the Company's Works, which abut on the Thames and Medway Canal.

The purchaser must pay Canal Dues.

Tenders must quote for Tar at per gallon, and for Liquor at per ounce of Strength per butt of 108 gallons. Twaddle's Test (at 60° Fahr.) will be observed.

The Directors do not guarantee any specific quantity of Tar or Liquor; but there will probably be about from 80,000 to 100,000 gallons of Tar.

Tenders, marked outside "Tenders for Tar and Liquor," sealed, and addressed to me as below, must reach me not later than Tuesday, June 5 next.

The Directors do not bind themselves to accept the highest or any tender.

By order,
CHARLES R. GRAMSHAW, Secretary.

27, King Street, Gravesend,
May 9, 1889.

CORPORATION OF WARRINGTON.

TENDERS FOR COAL AND CANNEL.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply of 12,000 tons of GAS COAL or NUTS, and 4000 tons of CANNEL, for One, Two, or Three years, from the 1st of July next.

Forms of tender and further particulars may be obtained on application to Mr. W. S. Haddock, Engineer, Gas-Works, Warrington.

Tenders, endorsed "Tender for Coal" or "Cannel," must be addressed to the Chairman of the Gas Committee, and sent in not later than the 5th of June next.

The Gas Committee do not bind themselves to accept the lowest or any tender.

FREDK. TAYLOR, Secretary.

Gas Office, Warrington, May 10, 1889.

HEDNESFORD GAS COMPANY, LIMITED.

THE Directors of the above Company invit TENDERS for the supply of 1000 tons more or less of best screened GAS COAL, delivered free at the London and North-Western Railway Company's Siding, Hednesford, in such monthly quantities as may be required for the period of One year, commencing the 1st of July next.

Parties tendering to state price in owners' and colliery waggons respectively.

Tenders, endorsed, and addressed to the undersigned, to be sent in not later than the 25th of May.

The Board do not bind themselves to accept the lowest or any tender.

By order,
WILLIAM S. MACGREGOR,
Secretary and Manager.

Gas Offices, Hednesford,
Staffordshire, May 11, 1889.

UXBRIDGE AND HILLINGDON GAS CONSUMERS' COMPANY.

GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of 3500 tons of GAS COAL, deliveries of which are to commence the first week of July next, and finish the last week in May, 1890.

Tenders to be made for 2000 tons of the best South Yorkshire Old Silkstone unscreened Gas Coal, delivered in Trucks, free, at the Uxbridge Railway Station, G.W.R. (21 cwt. to the ton), and for 1500 of the best description of unscreened Gas Coal from the Durham Coal Fields, delivered by barge, free, alongside the Gas Company's Works on the Grand Junction Canal.

Tenders are to state the names of the Pits from which both the above descriptions of Coal will be supplied. The Coal shall be fresh wrought, and free from Slate, Pyrites, and Impurities, and to the entire satisfaction of the Company's Engineer. Deliveries to be made according to the requirements of the Company.

Tenders to be received on or before the 8th day of June next, addressed to the Chairman, Gas Office, Uxbridge, and endorsed "Tender for Gas Coal."

No forms of tender provided.

W. & W. M. GARDINER,
Secretaries.

Uxbridge, Middlesex, May 9, 1889.

BOROUGH OF BIRKENHEAD.

TO TAR DISTILLERS AND MANUFACTURING CHEMISTS.

THE Corporation of Birkenhead invite OFFERS for the purchase and removal of the AMMONIACAL LIQUOR and surplus TAR produced at their Gas-Works, for a period of One, Three, or Five years, commencing from the 1st of July, 1889.

A pipe is laid between the Gas-Works and the River Mersey, for the conveyance of Liquor into the Contractors' boats; and the Corporation will, if necessary provide appliances on their own siding, to pump the Products direct into the Contractor's railway tank-wagons.

Forms of tender and further particulars may be obtained from Mr. T. O. Paterson, C.E., Gas Engineer at the Gas-Works, Thomas Street.

Tenders, sealed and endorsed "Tender for Ammoniacal Liquor or Tar," must be sent in to me not later than Five p.m., on Friday, the 31st of May, 1889.

The Corporation do not bind themselves to accept the highest or any offer.

By order,
ALFRED GILL, Town Clerk.

Town Hall, Birkenhead, April 29, 1889.

TO COAL PROPRIETORS.

THE Corporation of Birkenhead are prepared to receive TENDERS for the supply of the best quality of screened COAL, COAL NUTS, CANNEL, and CANNEL NUTS, for Gas Making purposes, for a period of One, Two, or Three years, commencing from the 26th of June, 1889.

Forms of tender, together with any further information, may be obtained from Mr. T. O. Paterson, C.E. Gas Engineer, Gas-Works, Birkenhead.

Tenders, stating the price per ton delivered on to the Gas-Works Railway Siding, must be sent in to me, sealed and endorsed "Tender for Gas-Works Coal," not later than Five o'clock in the afternoon of Friday, the 7th of June, 1889.

Also for a supply of STEAM COAL and SLACK, to be delivered at the Pumping-Stations of the Spring Hill, Flaybrick Hill, and Borough Road Water-Works, for a period of One, Two, or Three years, commencing from the 26th of June, 1889.

Forms of tender and any other information may be obtained from Mr. W. A. Richardson, C.E., Water Engineer, Town Hall, Birkenhead.

Tenders, stating the price per ton delivered at the various Pumping-Stations, must be sent in to me, sealed and endorsed "Tender for Water-Works Coal," not later than Five o'clock in the afternoon of Friday, the 7th of June, 1889.

Deliveries to be made from time to time according to the requirements of the respective Engineers.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
ALFRED GILL, Town Clerk.

Town Hall, Birkenhead, April 29, 1889.

BAHIA GAS COMPANY, LIMITED.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Company's Offices, Nos. 7 and 8, Idol Lane, London, on Thursday, the 23rd day of May, 1889, to receive the Report of the Directors, the Balance-Sheet confirmed by the Auditors, and for general purposes.

The Chair will be taken at Three o'clock precisely.

The Transfer Books are closed from the 8th to the 22nd inst., inclusive.

By order of the Board,
ALFRED J. HEAD, Secretary.

May 9, 1889.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is hereby given that the Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, on Tuesday, the 7th inst.

Sir JULIAN GOLDSMID, Bart., M.P., in the Chair, when the following Resolutions were unanimously passed:—

"That the Report of the Directors upon the affairs of the Association be received, adopted, and entered upon the Minutes."

"That a Dividend of £5 per cent. for the Half Year ended the 31st of December last be declared upon the £3,800,000 Stock of the Association, and that the same be payable, free of Income-Tax, on and after the 1st of June next."

"That Henry Wood, Esq., be re-elected a Director of the Association."

"That John Horsley Palmer, Esq., be re-elected a Director of the Association."

"That Henry M'Lauchlan Backler, Esq., be re-elected a Director of the Association."

"That Joseph Sebag Montefiore, Esq., be re-elected an Auditor of the Association."

"That Montagu Somes Pilcher, Esq., be elected an Auditor of the Association."

"That the cordial thanks of the Meeting be given to the Directors for their able Management of the affairs of the Association, to the Chairman for his conduct in the Chair this Day, to Mr. H. V. Lindon, Mr. L. G. Drory, the Agents, Engineers, and other Officers of the Association on the Continent, and to the Secretary and the London Staff."

By order of the Board,
R. S. GARDINER, Secretary.

30, Clement's Lane, Lombard Street,
London, E.C., May 8, 1889.

Just Published, Crown 8vo.; 7s. 6d. cloth.

WATER ENGINEERING: A Practical Treatise

On the Measurement, Storeage, Conveyance, and Utilization of Water for the supply of Towns, for Mill Power, &c., &c.,

By CHAS. SLAGG, Assoc. M. Inst. C.E.

"An excellent book."—*Engineering*, Jan. 25, 1889.

"The work is well arranged, and the manner in which rules and formulæ, which are distributed in many works, are brought together side by side, is such as to give much value to the compilation."—*The Athenæum*, May 4, 1889.

London: CROSBY LOCKWOOD AND SON, 7, STATIONERS' HALL COURT, E.C.

MARQUIS OF LOTHIAN'S

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No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.

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AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD
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PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles
Coke per ton	1,301·88 lbs.

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GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
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COAL OWNERS, NEWCASTLE-ON-TYNE,
E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

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have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke.

This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

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AND SONS, LIMITED,
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STEEL OF ALL DESCRIPTIONS.

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FOR
STEAM AND OTHER POWER.

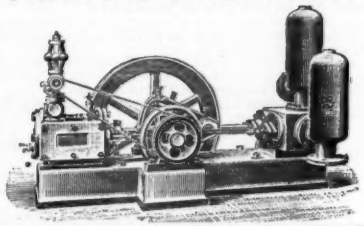

Fig. 685.—EVANS' Patent "RELIABLE" REVERSIBLE TAR and LIQUOR PUMP. In use everywhere. The Best in the World.

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SUITABLE FOR EVERY FORM OF LIGHTING.
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The Stills used with these Plants have been brought to a high state of perfection, and are now superior to any of the foreign appliances recently introduced.

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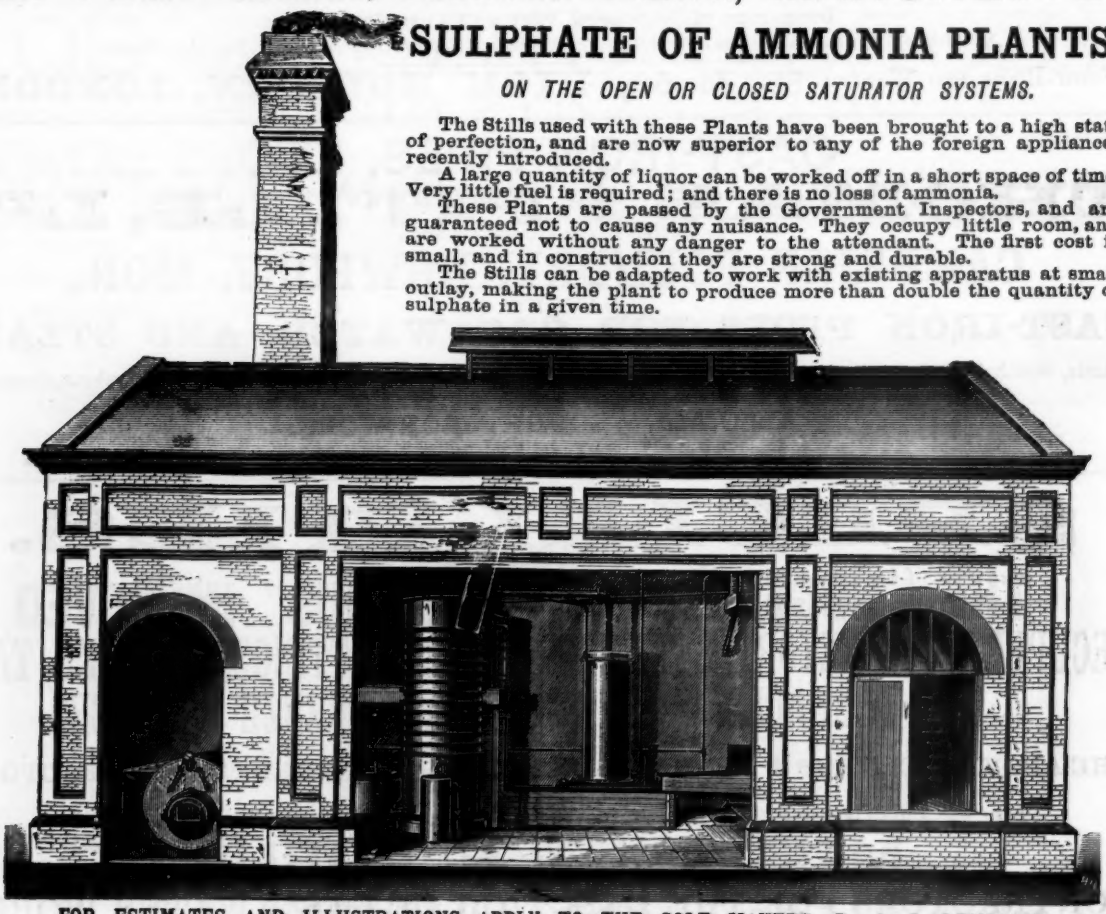

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[*As Illustrated and Described in the* JOURNAL *for May* 4, 1880.]

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ITS ADVANTAGES ARE:

IMMENSE ECONOMY IN THE CONSUMPTION OF GAS.

INTENSITY, PURITY, AND STEADINESS OF THE LIGHT.

Absence of Downward Shadow. *Practical Completeness of Combustion.*

CAN BE FITTED TO ORDINARY SUPPLY-PIPES WITHOUT ALTERATION.

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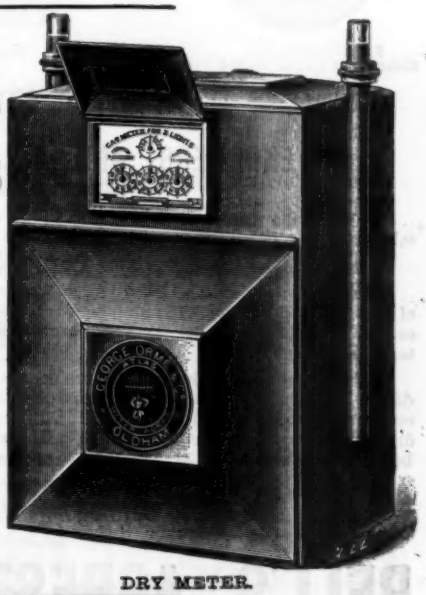

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ASBESTOLINE is the most efficient Lubricant for all bearings.
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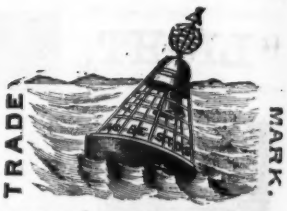

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ASBESTOLINE, to meet all circumstances, is made in four degrees of consistency—A, B, C, and CC.

ASBESTOLINE, A, is specially adapted to ordinary Land Engines and Machinery, in and out door, in this country.

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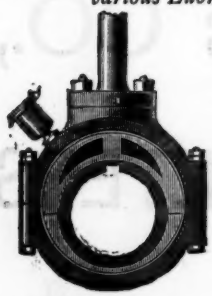
ASBESTOLINE, CC, is designed for use on Calenders, Paper-Machines, &c., where the bearings are heated by steam passing through, and sometimes is advantageously used instead of C.

The reputation of Asbestoline as a Lubricant of the highest efficiency in every kind of Machinery is established; and it has never been equalled by any other Lubricant in the numerous cases of special difficulty in which the best oils are ineffectual. It is used with marked success in Steel and Iron Works, Collieries, Cotton and Wool Mills, and other Textile Manufactories. In Corn-Mills it has proved invaluable on the roller and other modern machines. In Saw-Mills, on machines going up to 5000 revolutions per minute, its work has never been approached by any other Lubricant. On Electric Lighting Machinery, and in Steamships of all sizes throughout the world, the success of Asbestoline is unequalled. Many engines and machines of all descriptions give trouble, and show bad results both in working and wear, when the system of lubrication has not received due consideration. Engineering firms of the highest standing have given to it their powerful testimony and support.

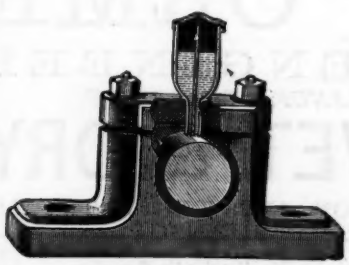
Supplied in Kegs, 28, 56, or 112 lb. Price, 2/3 per lb. Kegs Free. Special Terms for Large Quantities.

IMPORTANT TO EXPORT MERCHANTS.—*One pound of "Asbestoline" equals 2 gallons of Oil weighing 18lbs.; consequently the saving in freight is very considerable. Liberal Terms are conceded to Export Merchants.*

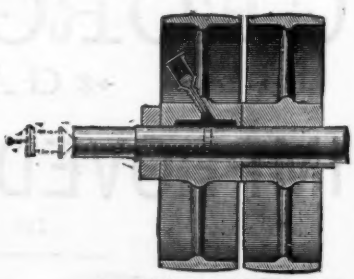
Below will be found illustrations of the mode of fixing Lubricators for Asbestoline to bearings. Full particulars of the various Lubricators supplied for Asbestoline, and the manner of fitting, in catalogue free on application.



Lubricator fitted to Eccentric of Vertical Engine



Showing Section of Lubricator fitted to ordinary Bearings.



Lubricator in different position for Loose Pulleys.

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ENGINEERS, AND ALL USERS OF STEAM POWER AND MACHINERY,

IS SPECIALLY INVITED TO THE FOLLOWING REPORT.

Owing to the number of Greases now offered, samples of BELL'S ASBESTOLINE were submitted to Otto Hehner, Esq., for analysis, and the subjoined Report fully proves BELL'S ASBESTOLINE to be the safest as well as the best Lubricant for all purposes:—

The Laboratory, 11, *Billiter Square, E.C., London, May* 3, 1888.

I have subjected a sample of Bell's Asbestoline taken from the stores of Messrs. J. Bell and Son, in Southwark Street, to a number of tests, in order to ascertain whether its use in Mills or Factories might contribute to the danger from Fire.

I found that Asbestoline **ignites only with the greatest difficulty** when brought into contact with flame; that wood and other combustible material soaked in Asbestoline burns, if anything, with greater difficulty than by itself; that its **flashing point** is so high that it **lies beyond the range of Mercurial Thermometers**; and that consequently no friction obtainable in the ordinary run of machinery is capable of developing inflammable vapours from it.

Bell's Asbestoline is **as absolutely safe a Lubricant as can be desired or obtainable.** In the case of fire breaking out from any cause, it does not assist the conflagration; and it is **quite incapable of leading to spontaneous combustion,** either by itself or in contact with inflammable material.

From the physical nature of Asbestoline its use is of necessity perfectly clean and free from waste.

(Signed) OTTO HEHNER, Public Analyst.

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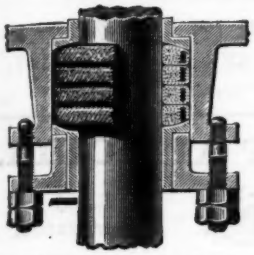
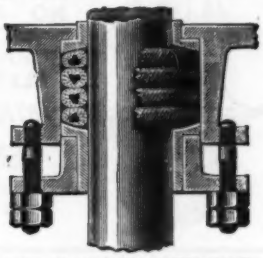
BELL'S ASBESTOS DAGGER PACKING

PATENT No. 15,493.



ROUND. SQUARE.



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Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT, DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest type. The Packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases.

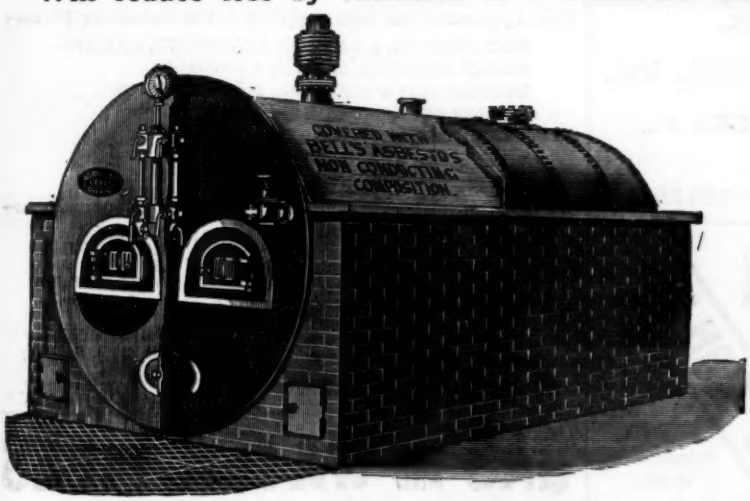
IN ORDERING STATE WHETHER SQUARE OR ROUND IS REQUIRED.

Price of either Section, 5s. 6d. per lb. Steam Vulcanized, 6s. 6d. per lb.

BELL'S ASBESTOS NON-CONDUCTING COMPOSITION,

FOR COVERING BOILERS AND STEAM-PIPES,

Will reduce loss by radiation to a minimum and save 40 per cent. of fuel.



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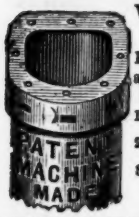

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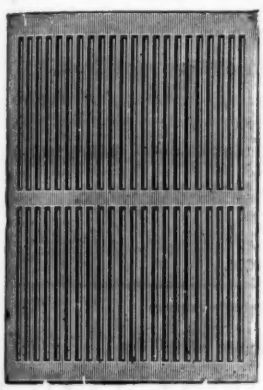

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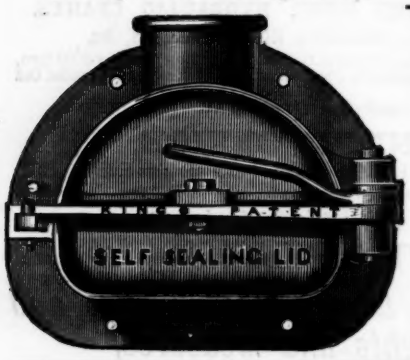

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